

80

microcomputingTM
the magazine for TRS-80 users

Beyond 80 Graphics

$D1 = \text{SQR}((X - 240)^2 + (Y - 80)^2) \cdot N1 + N2$
 $D2 = \text{SQR}((Y - 240)^2 + (X - 80)^2) \cdot N1 + N2$
 $M = X + 180 - \text{SIN}(D1/D1 \cdot 320) - \text{SIN}(D2/D2 \cdot 220)$

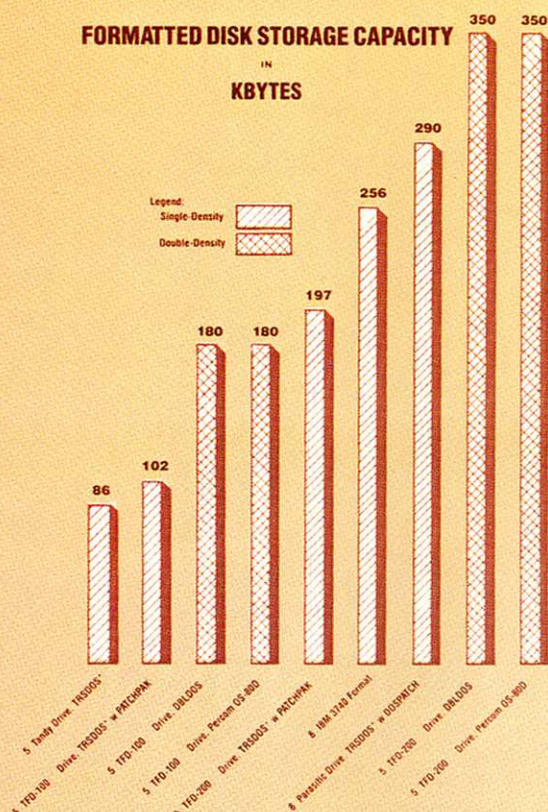
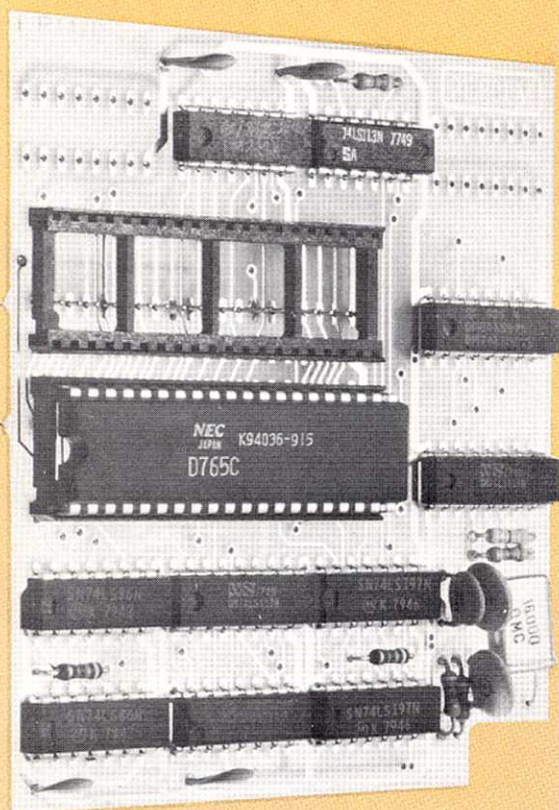
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ASSOCIATE PUBLISHER
Edward Ferman

ASSISTANT PUBLISHER
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Debra Boudrieau

BULK SALES MANAGER
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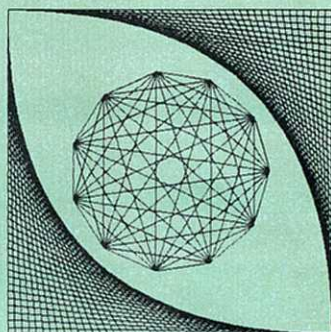
Manuscripts are welcome at *80 Microcomputing*, we will consider publication of any TRS-80 oriented material. Guidelines for budding authors are available, please send a self-addressed envelope and ask for "How to Write for *80 Microcomputing*." Entire contents copyright 1981 by 1001001 Inc. No part of this publication may be reprinted, or reproduced by any means, without prior written permission from the publisher. All programs are published for personal use only. All rights reserved.

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Part I Advanced Graphic Techniques by Bob Boothe

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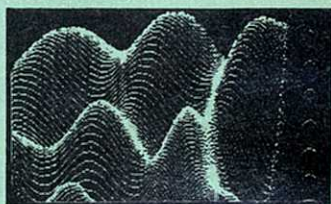
In the first of a three-part series on straightline graphics, Bob Boothe will show you what to expect from a TRS-80 and a dot matrix line printer. Part one deals with disk commands in ways you may never have thought of—especially in an 80 without drives.



A Turn of the Screw by Bob Boothe

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Some simple math programs by Bob Boothe produce some three-dimensional graphics that twist, turn and travel across your 80.



A High-Density Graphic Interface by Dennis Murray and Paul Fowler, Jr.

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Authors Murray and Fowler design a high-density graphics interface that will let you plot high-res graphics with no effort. The directions are here; you'll emerge with a better understanding of raster scan video concepts and more powerful graphics.

Programming for Education—Part 3 by Jerome I. Weintraub

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80 takes its first look at a new market trend. We surveyed a field of traditional book publishers to find out what their intentions were toward the burgeoning educational software market and how that industry will effect the textbook market in the future.

COMING NEXT MONTH

The May issue of *80* explores personal finance. Ever wanted a clear guide to the stockmarket? We've got an article which will guide you around the major pitfalls. We also have some sound advice on buying a new car and when to turn a profit on a new house. If that isn't quite what you need, another article will lead you through the whys and wherefores of sensible mortgage shopping.

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PUBLISHER/EDITOR
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ACCOUNTS RECEIVABLE 1.0 (including inventory package) A point of sale, invoice-generating and based accounts receivable program. Including INVC0 1.3 (a comprehensive manufacturing inventory program), this program will meet the specialized needs of almost anyone engaged in the wholesale or distributing business. The fastest and best program of it's type available anywhere. Requires a Model I, 32K, twin drive system. Also requires DOSPLUS 3.2. For speed, accuracy, and convenience, it can't be beat! Price quoted on request due to the custom configuring necessary in any business software.

SUPERBAK Any disk that will boot-up in your computer, this program will back-up. It will scan any disk created by the TRS-80 Model I, and create an exact copy of the disk. Retail price is **\$19.95**. Single density only.

MOTHER PACKER A string packing graphics generator for the TRS-80 Model I. Offers you graphics like you never thought you'd have. Draw maps, reports, anything, with lightning speed. Re-draw the screen so fast that you can present the illusion of continuous motion. Cost is only **\$9.95** on cassette. **\$19.95** on disk.

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80 REMARKS

by Wayne Green

"One of the... benefits of being over fifty is the ability to put things into... perspective; other than that, I'd sell the privilege..."

The Home Revolution

I get a bit annoyed at the term "home computer," or even "personal computer." To my mind, a computer is a computer, and it is your use for it that determines which kind it is—not the size or the price. Yet I can see the day coming when we will indeed have some home computers... and their impact may be far beyond anything so far predicted.

Let's go back and look at the changes we've had in home life over the last 50 years. One of the very few benefits of being over fifty is the ability to put things into some perspective; other than that, I'd sell the privilege in a minute. Fifty years ago most families had one wage earner and they spent a good deal of their time at home. Wives, for the most part, devoted their time to keeping the home in good shape, bringing up the kids, and providing a good meal for the breadwinner when he came home in the evening.

We joke about that formula now, but it was a comfortable one and it resulted in kids getting a lot of attention (and love) from their mothers. While feeling the home to be a place of love and protection, they also got more home education as a result.

When the war came and most of the men had to join the armed forces, the women had to go out and do much of the work. They learned to get along with automatic washing machines, automatic dishwashers, frozen foods and other means for cutting down on the needs of the home. They also cut back on teaching and supervising their children, which may have something to do with the change in our family relationships, as well as the growth of disrespect for almost everything.

After the war the men returned, but the women kept on working. This gave more and more families two incomes, so house prices quickly rose to accommodate them. This, in turn, forced the one wage-earner families to get another wage earner out there, with the result that the non-working wife today is the exception rather than the rule.

When I was young my mother had an art

studio, but the family came first, and I was raised with her reading to me during lunch. I developed an interest in reading which has stayed with me since. We spent many evenings playing games. I'm rather good at most of them. I enjoy a good jigsaw puzzle, a crossword puzzle, cryptograms and card games.

It may just be that the microcomputer will bring about some fundamental changes in home life. Firstly, the increased ability to communicate with anyone almost anywhere may allow many people to do most, or even all, of their daily work at home.

As the use of computers in education evolves beyond the simple things being done today, it may be easier for kids to learn at home. It may even be better for them. Schools may continue, complete with teachers, but more devoted to providing skill training than memorization. This will reduce the hours of use for the schools—perhaps only a couple days a week.

There is little question that computers are going to simplify the job of running and maintaining a home. Most grocery and other shopping should be computerized, thus making it possible for people to spend far more time at home than has been the practice during the last two generations. With much of the time devoted to both work and school being focused back on the home, perhaps children will get the attention and love they need.

Even movies are coming into the home via cable and video cassettes or disks. This may not be the best time in the world to buy restaurant stock.

If such a change does come about, I wonder if it will result in changes in the next generation? Will we see a drop in vandalism? In graffiti? Perhaps even in crime?

The new lifestyle will be much more energy efficient, with far fewer short trips for groceries and other local shopping. We may see a growth in the size of the number of malls, where families can go out to eat and look through a number of stores.

Our schools may get away from the usual classroom and tend to have labs and workshops where people can learn skills

such as woodworking, sculpture, metalworking, foundry, electronic repairs, swimming, and a hundred other skills which require both skilled teachers and equipment.

That there has been a major change in children is certain. The reasons for this change are a bit more difficult to pin down.

We know that there has been a change in the home: We also know that the change was concomitant with the development of television, so that medium gets much flack. We also had the rising influence of Dr. Spock encouraging parents to give their children much more freedom than before. We can add in other factors, such as the impact of the Viet Nam war and perhaps even the war in Korea, neither of which were perceived with the patriotic fervor of WWII. I guess Hollywood let us down on our most recent wars... and television too. ■

Keying in Programs

Since it is a lot of work to key in a program from a magazine and one single error can (and usually does) screw up everything, we are preparing monthly dumps of the programs from *80 Microcomputing*. They'll be available on cassettes.

There seems to be some question in the minds of many readers about the legality of keying in a program and then providing a copy of this to a friend. Sorry to say, this is absolutely illegal. The material in this magazine is copyright. This means that you can read it and use the material for your own benefit, but you are not permitted to make copies and send them to friends without the specific permission of the publisher (me).

This is also true when it comes to passing along copies of these programs at clubs, over the telephone, via bulletin boards, etc. These are all copyright violations.

Yes, I agree there seems to be little harm in saving someone all the work of keying in a program—particularly when they, too, are a subscriber to the magazine. But if you take the seat of the pro-

Continues on page 10

INSIDE 80

by Ed Juge, director of
computer merchandising, Tandy Radio Shack

"I'd like to thank those of you who responded to my request to let us hear your comments and suggestions. This time, you wrote."

This month, I'm taking a lesson from Jon Shirley, our Computer Merchandising VP. I'm starting my column at 35,000 feet over Plainview, Texas, enroute to beautiful Scottsdale Arizona for a three-day industry conference.

I'd like to thank those of you who responded to my request to let us hear your comments and suggestions. This time, you wrote! Our product managers have lots to work on, and it helps.

Model III Program Compatibility

Here's a subject which needs to be put to rest! Rumors have the compatibility figure between Models I and III running between 10-90 percent. A list follows of every Model I program which we know is not directly compatible or convertible to Model III. If the Model I program you're concerned with is *not* listed, you may assume it will run on or convert readily to Model III. (There may be incompatibilities we haven't found yet).

Programs which require program changes before use (your Model III comes with detailed instructions for changing, or you may order a modified version through your store at no charge, if you own the Model I package):

| | |
|--------------------|-------------------|
| Cassette Portfolio | Budget Management |
| Tape Mail List | Lvl II Course-II |
| Real Estate III | Real Estate IV |
| Dancing Demon | Casino Games |

The following programs cannot easily be converted. We will furnish a Model III compatible version at no charge to owners of the Model I version. (Model III versions are being included in future packages):

| | |
|-----------------------|-------------------|
| Mailgram | Scriptit Cassette |
| Scriptit Disk | Versafile |
| Profile | Microfiles |
| Fortran | S&P Stockpack |
| Business Mailing List | Micro Movie |

Scriptit Disk, Fortran, and Stockpak Model III versions are not completed as of the date I'm writing, but we hope they will be by the time you read this.

Following are the only programs which will not run on or convert to Model III:

Space Warp
MicroChess
Editor/Assembler
Visicalc—Model I
Disk Instruction Course
T-Bug

RS-232 Comm Pack
RS-Term
Tiny Pascal
Renumbr
Disk EDTASM

Similar packages for the Model III are in the works for all of these except Renumbr, which will work on Model III. In-Memory Information 26-1502 has already been replaced with 26-1508, same name, Model III compatible.

All programs not listed will run on or convert to Model III, using the Model III TRSDOS convert utility.

Scriptit and Line Printer IV

I want to correct a misunderstanding regarding the Line Printer IV. When we advertise a printer, of course we advertise the capabilities of the hardware. All of you aren't using all Radio Shack software, most of you have some programs you've written, and some (perish the thought) non-Radio Shack programs you've bought. Some of you bought one of our printers to use on someone else's computer. (See... we do admit there are other computers!)

We told you LP IV is capable of several different software-selectable type sizes or fonts, including high-density proportional spaced type—and it is. Unfortunately, our Scriptit packages do not support all the printer's capabilities. For example, Scriptit currently can't send the control codes to the printer for the change of type sizes. From BASIC or from a short user-supplied machine language program, but *not* Scriptit, you can command LP IV to go into proportional spacing.

Scriptit cannot justify proportionally-spaced type (our experts tell me there are maybe a half-dozen very expensive word processors which do offer this feature). Proportionally spaced type (on LP IV or Daisy Wheel II) looks great, but you can't use it with Model II Scriptit features like underlining, bold face, or decimal alignment tabs. Proper line length is also hard to judge, since different proportional characters occupy different widths.

We've never indicated in a Scriptit ad or story that these things could be done. Some folks misunderstood and expected

to do things with LP IV that couldn't be done. We're sorry, there was no intention to mislead you.

Model II Scriptit offers three methods of justification. Space insertion works fine on LP-IV, and inserts full spaces between words. The other two methods are word increment and character increment, which insert fractions of spaces between words or characters to justify the line. Leave them for the Daisy Wheel II owners!

LP-IV is a dot-matrix printer, so the head must be travelling at a specific speed to print a character. If the printing is interrupted to process a command like backspace or space insertion, the head must return to the left margin and start over to print the next character. The result is that in these last two justification modes, the head will go "home" between every word or every character. Needless to say, throughput suffers.

Model II Owners Note

Two items: There seems to be some question about backing up Model II Scriptit disks. You can only do it with Scriptit's own backup utility. It won't backup using TRSDOS's backup command.

Secondly, a fair number of disk error reports from the field are still turning out to be eight-inch diskettes manufactured to single-density standards. They cause problems on a double-density system. You should weigh the cost saving carefully against your budget for disk errors.

Line Printer III/IV Tips

The first of this year we got some bad ribbons for LP III and V. They have all been replaced, and should be out of our system now. One fact that many people don't realize is that these printers will lay about 500,000 characters on paper in an hour of continuous printing. The rated ribbon life is two million characters. That's only four hours of hard use!

Pushing a ribbon for more service can cause it to tear. When this happens, the torn ribbon can hook one of the print wires and destroy the head. That's expensive—on anybody's dot-matrix printer!

To help you extend your LP III or V head

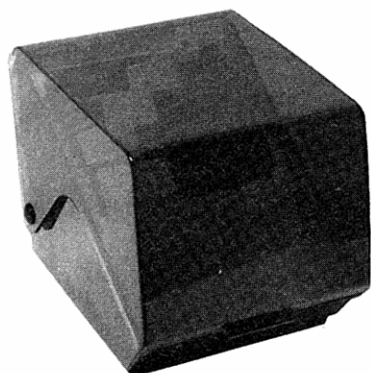


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• Ohio residents add 6½%
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life, we have a head cleaning kit available, specifically for these printers. Your local Radio Shack store should order Cat. No. 700-3010. Though not usually a store-stocked item, they're readily available. Simple instructions are included.

Computerama '81

I hope you'll watch for this Radio Shack computer show when it hits your area. We're putting on shows in major cities again this year until June. We're showing all the new computers, Model III, Pocket Computer, Color Computer, and, of course, Model II. The format is a little different this time, and after a shorter main show, you can visit individual display areas for Script, Visicalc, home uses (including Videotex), accounting applications, computers in education, and the Pocket Computer. In each room, there is a ten minute videotape presentation, followed by a chance to ask questions. I think you'll enjoy the show, and find there's lots of new material to see.

One new item at the show is Radio Shack's new Extended Color BASIC for

"One fact that many people don't realize is that those printers will lay about 500,000 characters on paper in an hour of continuous printing."

the Color Computer! You must have 16K RAM to use Extended BASIC. Space is required for BASIC to operate, for graphics, and for video; a maximum of about 14.5K is user-available.

You'll see one-line instructions to draw a line from point A (x,y) to point B (x,y), make it either the foreground or background color. You can set foreground and background colors or draw a box by designating the coordinates of opposite corners in a single command.

You can draw a circle by specifying center and radius or just start and ending points, if all you want is part of a circle. You can also specify a height/width ratio to squeeze the circle. There's even a color parameter, if you're in a more-than-one-color mode.

With Extended Color BASIC you can load and save machine language tapes. You can specify an offset address to add to the loading address if desired. You can specify loading machine language pro-

grams at 300 or 1200 baud.

Modem I Specs Changed

Now for the bad news! It's more embarrassing than bad: Our newest computer catalog—RSC-5—and a few magazine ads list our new low-cost modem as 300/600 baud. The art and copy had such long lead times, we couldn't correct a last-minute change in specs. Modem I will be 300 baud only. In final Q.A. testing of production units, we found an unacceptable error rate at 600 baud. Sorry for any inconvenience. Model I owners will find a listing of a software package (and cable) which let you connect the Modem directly to your cassette port, for half-duplex operation without an expansion interface!

80 REMARKS

gram's author, your perspective will change substantially. The author has a deep interest in getting the most from his hard work. The money he receives for one time publication really isn't enough, especially when his is a particularly useful program. This is why we are going to provide all of the 80 Microcomputing listings on cassettes, with the royalties going to the authors.

In some cases, where a program is particularly valuable, it may also be issued by Instant Software as a separate package, or as part of a package. In this case the royalties may escalate surprisingly.

We're aiming at making the cassette dumps of the programs available for each issue of 80 as the magazines come out. They will hopefully be in stock in the computer stores carrying the magazine . . . and eventually they will be available by subscription. As soon as everything is ready to go, you'll be seeing announcements of the service and the cost. ■

Programmer Demands

If one were to try to judge from the letters and phone calls, it is a jungle out there for programmers, with rip-offs right and left. Well, what should a programmer be looking for if he wants to get his program distributed?

A programmer needs to look into several aspects of program publishing before making a decision. He needs to know about the distribution the firm has set up, the royalty arrangement, the reliability of the firm and the advertising backup his program is going to get.

New, Low-Cost Line Printer VII

LP VII is an 80-column wide, tractor-feed line printer which uses plain paper and a ribbon that sells for \$399. Its tractors are adjustable from 4½ to 9½ inches. Printing can be 80 or 40 characters wide on an eight-inch print line, upper and lowercase, at 30 cps. There's also a graphics mode for fully dot-addressable graphics.

We've provided both a serial (color computer) and parallel (other 80s) interface. I'm going to take my life in my hands and say it's available now. (Remember, your "now" is April, mine is early February, and there are two months in between for Murphy and his law to play with.)

Well, time flies when I'm having fun. I'm late again, so until next month . . . ■

It stands to reason that a firm is going to be able to do a better job of selling a program if it is able to get it into almost every computer store in the U.S. and also, translated into other languages, into computer stores in other countries. A fundamental fact of life in sales: the more outlets you have, the better your likelihood of selling. This is why Instant Software has not only instituted a rep sales organization to cover the entire United States, but is also developing sales in 22 other countries.

Royalty Percentage

Your royalty is important too. Instant Software pays 20 percent and this seems to be both the standard and the top royalty being paid by any of the major software publishers. This is a good deal higher than book royalties, but then the idea was to encourage software writing—good software writing.

Another serious problem for the programmer is connecting with a reliable firm. One after another, program publishers have been going out of business, or selling out to other firms. This can raise hell with programmer contracts. Large ads do not a reliable firm make, unfortunately; so programmers should be wary.

Broad-based Advertising

Even the best of software won't sell if it is not advertised, so the ability of the program publisher to back up your program with ads is important. If your program is being sold only by mail order, you will have to make do with a fraction of the sales that you might expect if it were also sold through dealers.

More and more firms are developing their own distribution and advertising, so keep your eyes open and make sure that you connect with a good firm. ■



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foreword by

H.C. PENNINGTON

James Farron

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& OTHER MYSTERIES

for the TRS-80



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REMDISK-1 \$29.95

Call now and place your order for this new book, "MICROSOFT™ BASIC DECODED & OTHER MYSTERIES for the TRS-80™", from IJG, Inc. A primer for cassette and disk BASIC on the TRS-80™, the information provided applies to similar MICROSOFT™ BASIC interpreters. Features include definition of terms, an overview of BASIC and DOS, explanation of exits, error codes, verb actions, "cold" and "warm" restart procedures and examination of system utilities, arithmetic support and I/O driver routines, and the communications region in RAM. Individual routines are explained in detail, with an index provided for easy access. Appendixes include tables for BASIC and DOS vectors, stacks and interrupt locations, PLUS thousands of comment lines for the complete MICROSOFT™ BASIC.

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Speed Reading
Check Digit Generator
Personality Test
Morse Code
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Calculation of the Number of Days

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Real Estate Evaluation
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*"A little got to the printer
but most just spilled right out on the floor.
It was horrible—
wall-to-wall alphabet soup!"*

Oh, Really?

I recently acquired a printer for my TRS-80 and wished to produce a hard copy duplicate of the monitor screen. Although I am not very proficient at programming, I could think of several possible ways to do this. However, as I am not too ambitious, I resorted to the yearly index in your December issue and came upon several articles detailing this very nicely.

Having made my selection, I carefully entered a screen printer subroutine from the March issue. I listed the program and proofread it carefully. I was all ready to go.

I hurriedly filled my screen with Quick Brown Foxes and several Lazy Dogs along with a couple of Now is the Times, and turned on my new toy. This is where the fun began.

While the program apparently ran perfectly as I GOSUBed 20000, I had failed to tighten the printer cable sufficiently and, as you have probably guessed by now, nearly all the screen's contents were dumped right on the carpet. A little got to the printer but most just spilled right out on the floor. It was horrible—wall-to-wall alphabet soup!

I am only glad that it was not the large print, for the vacuum cleaner may not have gotten it up.

I. T. Phoolesme
TaWorrie, NW 01313

Prechilling the interface cable generally slows this type of overflow to the point where you can catch it in a bowl if it occurs.—Eds.

CROSSREF Complication

D. N. Ewart's CROSSREF in the January issue immediately struck me as a very valuable utility—if only I could get it to work. After two attempts to key it in, I still couldn't get it to output the right line numbers.

Closer inspection showed that the computation is done in an absurdly complicated way: The program DIMs an array of

the powers of two, and does successive additions to sum up the line number.

I recommend that others who've had problems with this try deleting lines 65520-65522, and insert: 65520 Y = PEEK(I + 4)*256 + PEEK(I + 3):RETURN.

The wasteful B() array can be omitted altogether from line 65504, and all the non-string variables can be DEFINED at the integer level. These are helpful tips since the program can be quite useful for very long programs.

Dr. S. C. Mills
Wittenberg University
Springfield, OH 45501

Betrayed

On page 185 of the February, 1981 issue of *80 Microcomputing*, I see an ad for a PMC-80 computer.

I thought *80 Microcomputing* was for "TRS-80 users". As a TRS-80 user who is proud of his computer and his magazine, I feel betrayed by this ad for a competitor's machine.

Let PMC-80, PET, Apple, and the like advertise in their own users magazine.

If the ads in my magazine cannot support my machine, I am not interested.

David C. Mauldin
Hickory, NC 28601

Will you feel betrayed by our coverage of the Color Computer? The Model II or III? The Pocket Computer?

The PMC-80 bears a closer resemblance to the Model I than any of these.—Eds.

Deathmaze, Anyone?

"To Everything There is a Season" says Debra Marshall, as she explores Deathmaze 5000 (Med Systems Software). Upon reading the review by Ms. Marshall, I became very excited about this particular software program. Well, I looked up in the list of advertisers for Med Systems Software, and lo and behold, page 49 was to be my salvation (or destruction?). It was 2:00 pm on a Saturday and I thought I

would have to wait until Monday to give MSS a ring (Rats!). I gave it a try anyway and they answered. A very polite gentleman informed me that my phone order for Deathmaze 5000 would be in the mail Monday. I asked him if he had read the review by Ms. Marshall and he said he had. He also said that if she likes Deathmaze 5000, she would "fall out of her chair" over Asylum.

By means of this letter I am offering to supply Ms. Marshall with a seat belt for her chair. After all, if she isn't getting any work done due to Deathmaze 5000, she will get even less done on the floor!!

See you in the Mental Ward!

Jeffrey Machusak
Joseph City, AZ 86032

I will take your kind offer under advisement, and add the seatbelt to my collection of crystal balls, rotten sneakers, and magic rings.—Debra Marshall, 80 Editorial

Programma Review

I appreciate your review (80 Reviews, February 1981, Bruce Douglass) of the 80-Grafix board from Programma International, Inc., but I hope you'll give me the opportunity to clear up some minor misunderstandings the reviewer may have had concerning our product.

Mr. Douglass' review may leave the misconception that our use of the cassette port may somehow interface with normal cassette operation. Use of the 80-Grafix board does not interfere with either normal or high-speed cassette operation. There is no external connection to the cassette port; the interface is entirely internal to the TRS-80. None of the port outputs affect cassette operation in any way.

Mr. Douglass seems to feel that programming our board requires a great deal of memory. He points out that programming the board requires up to one full K of memory, and video memory at that. There are advantages to this method. For example, to obtain an effective resolution of 384 x 192 pixels, it would take a memory-mapped screen of 9K; we require only 1K!



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 - DELETE FIELD contents.
 - RESTORE FIELD contents.
 - RIGHT-JUSTIFY FIELD contents.
 - SKIP FIELD (to next or previous field).
 - SKIP RECORD (to next or previous record).
- SORTING of records is MACHINE CODE assisted.
 - 200 RECORDS (40 characters) in about 5 SECONDS.
 - ANY COMBINATION of fields (including numerics) with each field in ascending or descending order.
- SELECTION of records for Loading, Updating, Deleting, Printing and Saving is MACHINE CODE assisted.
 - Specify up to 4 CRITERIA, each using one of 6 RELATIONAL COMPARISONS.
 - LOAD or SAVE selected records using MULTIPLE FILES.
 - Example: Select records representing those people who live in the state of Colorado, but not in the city of Denver, whose last names begin with "F" and whose incomes exceed \$9000.00.
 - Example: Select records representing those sales made to XYZ COMPANY that exceed \$25.00, between the dates 03/15 and 04/10.

MAPS-III (MTC AIDS PRINT SUBSYSTEM), included at no charge, has the following features:

- Full AIDS-III SELECTION capabilities.
- Prints user-specified fields DOWN THE PAGE.
- Prints user-specified fields in titled, columnar REPORT FORMAT, automatically generating column headings, paging and (optionally) indentation.
- Can create a single report from MULTIPLE FILES.
- Prints user-defined formats for CUSTOM LABELS, custom forms, etc.

BELOW ARE TESTIMONIALS from owners of AIDS systems. These are absolutely authentic statements and are typical of the comments we receive.

"This program will do more for my business than all the other programs I have, combined."

David Wareham, Vice President (EDP), National Hospital and Health Care Services Inc.

"We have 32 different Data Base Management packages for the TRS-80. AIDS-III is easily the best. It also makes it easier for us to step up to our Model II since the package is available for both computers."

Jack Bilinski, President, 80 Microcomputer Services

"Your AIDS program is far and away the finest information management system that I've ever seen. I am currently using it to maintain a clear picture of the demographic data on all the kids in our residential treatment program and it is working for me superbly."

Frank Boehm, Director, Front Door Residential Treatment Program

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- Use for accounting, inventory, financial and other numeric-based information systems.
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This subsystem will combine up to 14 AIDS-created data files into a single, large file. An optional purge capability removes duplicate entries while performing the merge operation (can even be used to eliminate duplicates in a single file). Machine-code assisted for high-speed performance, MERGE-III™ properly handles files sorted by any combination of fields, including numerics, with each field in ascending or descending order.

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Once the board is programmed, it remains programmed until the mode is changed again. You can program the board from DOS, or System, or from another BASIC program, and never use any space in an application program at all. This unique programming method allows you to design high resolution graphics characters for programs designed for Radio Shack's standard low-resolution graphics.

We do state that you can use both high resolution and low resolution graphics after our system is installed—and you can. Our experience answering telephone inquiries has shown that users don't mind not having them both at the same time. They generally want either the old (for their old programs), or the new. But if you must have some of each, there's no reason you cannot program Radio Shack's low resolution graphics into our high resolution 80-Grafix board.

Though I suppose there is somewhere a firm distinction between lowercase and a graphic character that only looks like lowercase, in general use, I cannot find such a difference. Programma's lowercase includes the ability for both DOS and BASIC input in lowercase. The problem with the printer substituting uppercase for lowercase and vice versa is directly a fault of the internal design of the TRS-80; the shift-key was designed by Radio Shack to operate backwards. We fixed it for the screen.

You can still use SET and RESET with low resolution characters, while using the high resolution characters elsewhere at the same time. All you have to do is program each of Radio Shack's low resolution single-pixel characters into the same positions in the high resolution mode. Then SET and RESET (and POINT) work as before.

I don't really see any reason for berating the demonstration software included with the board. True, one of the programs is a rather lengthy ad for our own product. What better way to show off lowercase, inverse video, high resolution and extensive graphics, than by using them to explain themselves? The program is, after all, a demonstration program; looking at the listing (simple, straightforward, and well commented) demonstrates more than adequately how to get the features in your own programs.

The character generator you get does appear different from the one in the ad. The one in the ad hadn't been invented yet when the photograph had to be taken. The programmer just programmed the screen, for the convenience of the photographer, due to the long lead times involved in ad-

vertising photography. When the character generator was finally programmed, there were differences between the original conception and the final program. But the character generator we supply is more convenient to use, as it supplies data statements which can be used directly in your own BASIC program, instead of having to use separate machine-language drivers.

If you do prefer working with machine-language files, we have reasonably priced systems which manipulate pre-defined and custom character sets in disk and tape files.

Jeff Lasman

TRS-80 Project Coordinator
Programma International, Inc.
Burbank, CA 91504

ZBUG Thanks

Your ZBUG article in the January '81 issue forced me to take pen in hand and thank you and Lt. John B. Harrell, because it really is a super Debug monitor.

I enjoy programming in BASIC and have only dabbled at assembly language, having only EDTASM but no T-BUG or facsimile. ZBUG worked the first time I loaded it and I am now more enthusiastic about writing some assembly language subroutines for my BASIC programs.

I did find a minor flaw in the ZBUG listing in Part 4 which I corrected to clean up the screen display. Line 406 needs seven more blank spaces between CONTENTS and MODE for the TITLE.

Many thanks to the authors throughout the country making my family's hobby more fulfilling and enjoyable.

Bob Clark
Plainfield, IN

Shack Statistical Fix

Thank you for Robert P. Johnson's review, "STATS," in the December issue of *80 Microcomputing*. It is a thoughtful evaluation of the Radio Shack and Creative Computing statistical programs, and it helps in making a choice between these two packages.

Radio Shack has issued corrections for a few errors in their statistical programs, but there is a bug in their chi-square program that has not been mentioned in any Radio Shack literature that I have seen. The error occurs only in chi-square problems involving one degree of freedom, for which the Yates' correction for continuity is applied. The Yates' correction is supposed to reduce the chi-square value, but

in the Radio Shack program it has the opposite effect. The program can be fixed by changing the last statement in line 280 to: $CS = CS + (ABS(O(I,J)) - E(I,J)) - CC/2 * E(I,J)$.

The error resulted from the simple omission of the ABS term in the original statement. The error (and the fix) would be obvious to anyone with fair knowledge of both programming and statistical inference—if one suspected a problem and checked the program.

Cynicism may be an unappealing trait, but "suspecting problems" is almost a virtue for the software user. The old advice still holds: Conduct trial runs of a new program and compare the results with results that are known to be correct, before relying on the program for any serious application.

Alfred L. Brophy, Ph.D.
West Chester, PA 19380

Packing Color Strings

If you have a Color Computer, you have noticed that SET and RESET graphics are just as slow as they are on the Model I. With the Model I you have an alternative by using VARPTR to pack strings with graphic characters, but that command was left out of the 8K Color BASIC.

As a software author, I wanted to get the Color Computer and see what I could do with high resolution color graphics, but Tandy hasn't released the information on how to get into HI-RES yet. I started to search for an alternative method to produce graphics until I became more adept at the 6809 instruction set.

The Color Computer stores variables in much the same method as the Model I. Strings are stored as follows:

NAME1/NAME2/LEN/MARKER/ADDR1/
ADDR2/MARKER

Name1 = first character of variable name

Name2 = second character's ASCII value + 128

LEN = length of the string

MARKER = is apparently a delimiter (00)

ADDR1 = first byte of string's address

ADDR2 = second byte of string's address

MARKER = another delimiter (00)

Because the 6809 doesn't store numbers backward, you can find the string's address with the formula $ADDR = ADDR1 * 256 + ADDR2$.

Non-SET graphics on the Color Computer are even simpler than I first imagined by using this information:



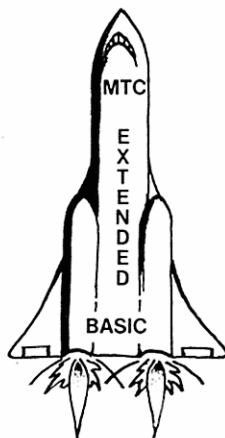
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basis (see TRSDOS technical information in TRSDOS & Disk BASIC Reference Manual). This facility seems to consistently drop the last sector, so I have found it necessary to pad my files at the end. Check out the LOF function—I haven't tried it on these files.

Bill Bunn
Covelo, CA

BASIC Doodle

In the article "Doodlebug," I felt the unexperienced programmer without machine language orientation was left out. I have developed an 11 second, BASIC, reverse video program for Level II:

```
5 ON ERROR GOTO 120
.
.
.
100 FORB 15360TO16383:POKE B,319 - PEEK(B):NEXT
110 RETURN
120 RESUME NEXT
```

One word of warning: The program will demolish any letters on the screen.

Mike Case
2304 Lakeview Dr.
Melbourne, FL 32935

TC-8 Cassette Interface

I am the owner of an early model TRS-80 microcomputer, which has a CTR-41 cassette recorder instead of a CTR-80.

A few weeks before Christmas I purchased a TC-8 Cassette Interface unit from JPC. I assembled the unit at a friend's home, following the very well written assembly instructions. The system tested flawlessly and just as advertised. I was extremely pleased and delighted with my new hardware and software.

I later connected my TC-8 to my CTR-41 cassette recorder after modifying it in the manner explained in the TC-8 Cassette Operating System users manual. I was surprised to find that the recorder motor control function was not working. The CTR-41 motor ran whenever any of the control buttons were depressed. This malfunction made it impossible to make use of one of the TC-8's nicest features; the ability to position to various program and data files on the tape. After ascertaining that the required modification had been performed correctly, I decided to call the folks at JPC.

I was introduced to a Mr. Bruce Kernodel and we exchanged information to establish exactly what my problem might be. Mr. Kernodel was highly knowledgeable of the inner workings of both the TC-8

and CTR-41. He explained that the CTR-41 modification is designed to connect system ground to power supply ground directly while bypassing the remote jack. He also explained that this leaves only the motor to be switched by the remote jack and thus reduces the amount of current that the TC-8 and TRS-80 must handle in turning the cassette recorder off and on. Mr. Kernodel also mentioned that in the past all of the CTR-41 recorders they had seen were wired exactly the same with regard to the wires connecting the remote jack to the circuit board. He did say, however, that if for some strange reason they were not wired that way in my recorder I would need to reverse them.

I followed Mr. Kernodel's advice and reversed the two wires. I was relieved to discover that the TC-8 now functioned beautifully.

If you have followed all of JPC's instructions correctly and have the problem I have had, locate the two small white wires connected to the remote jack and try reversing them.

My thanks to Mr. Kernodel and the folks at JPC. Their product and support is first rate and deserving of praise.

J. P. Richmond, Jr.
St. Albans, WV 25177

Short Stuff

This short utility grew out of a competition between my son and myself, with Jeffrey finally getting the last word when he got it down to 28 characters (including the line number). At that point I thought it just interesting enough that you might want to pass it on to your readers to elaborate on.

Robert F. Vavasour
St. Johns, Newfoundland A1A 3B5

The World's Shortest Wordprocessor:
Written by Jeffrey Vavasour, 11 years old
1 PRINTCHR\$(14);INKEY\$;GOTO1

The program could be further shortened to remove the cursor, by only typing "PRINT INKEY\$;GOTO1". Clearing the screen, either in whole or in part, is performed by first positioning the cursor by using SHIFT and one of the arrows, then pressing the CLEAR key which will erase the screen from the cursor position to the bottom of the screen.

Printer output is obtained by using the JKL feature of NEWDOS.

END Your Programs

Your December issue more than paid for the first year's subscription. "Assemble It Yourself" by Richard Koch makes Radio Shack's Editor/Assembler usable for the first time. The article is quite clear, and the Program Listings gave no prob-

lems. Well done!

I also found Richard Halloran's "Printer Pagination" quite useful, and lost no time in using it. No one-upmanship intended with the enclosed listing of my version of Mr. Halloran's program.

```
10 CLEAR500
20 OPEN"1",1,"PROGRAM"
30 CLS:PRINT@320,"LOADING THE PROGRAM INTO MEMORY"
40 PRINT:PRINT"IN CASE YOU FORGOT, FILE NAME IS 'PROGRAM'"
50 PN = PN + 1:LPRINTSTRINGS(70," ") "PAGE "PN:LPRINT" "LPRINT"
60 IFPEEK(16425)=50 THEN LPRINTCHR$(12):GOTO 50
70 LINEINPUT #1,RS
80 LPRINT RS
90 IF RIGHT$(RS,3)="END" CLOSE ELSE 60
100 LPRINTCHR$(12)
110 END
```

I would like to offer your readers the following suggestions: Call the last line of the program to be LISTED "END". Then it is not necessary to count (or remember) the number of lines in the program. The printer will stop when the program line is "END" and do a last top-of-form. Line 50 of the new version automatically prints the page number at the top right corner of each page of the listing.

Finally, be sure that the number of characters in each line of your program does not exceed the number of characters per line of the printer, otherwise the pagination will become skewed. My Line Printer II (Centronics 730) will issue a carriage return/linefeed automatically at the end of 80 characters, while the TRS-80 updates location 16425 only when the program calls for a linefeed.

Gary Himler
Granada Hills, CA

Two ROM Improved?

The change by Radio Shack from the three ROM version of the TRS-80 to the two ROM improved (?) system blocks reading tapes on the second cassette connected to the interface. They can be written to, but not read. This arbitrary change is contrary to the claims and technical data on the interface, and Radio Shack should be pressured into putting the feature back. In fact, the read function is the most useful aspect of having a second cassette recorder, since it can be used as a software ROM to load utility programs into protected memory. Included in those programs is the printer driver, etc.

Readers should take appropriate steps if they are considering buying an interface with the intention of using all the stated facilities.

I'fan Gwyddno Hall
Pickering, Ontario

Whatever happened to eenie, meenie, miney, mo?

...a perfect gift for that urban cowgirl!

Maybe this'll help me choose a career...

I could use it to select my staff.

Should I buy stock or commodities in this economy?

I could be another Solomon...

This may put the Godfather out of business.

If only my heart would stop racing...

It must use Bayesian, weighted factor analysis, and...

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Would I rather have Winston's millions or Billy Joe's love?

Hmmm... could be my ticket to the Boardroom.

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point is 1AF8H, and it returns with HL pointing to the two bytes of zeros which mark the end of the program. Code to use this routine would go at the end of the compression process, and might look like:

```
CALL 1AF8H ;RESET THE FORWARD CHAIN
INC HL ;BUMP HL PAST
INC HL ;THE ZERO BYTES
LD (40F9H),HL ;PARK IT AS END OF PROGRAM
```

Anyone who compresses their programs should be warned to save the original. The first reason is obvious: After a program has been compressed, it is hard to read, and future updates would then be more difficult. The second is more subtle: Removing blanks from a 'tokenized' BASIC program will not cause any immediate problems, but if the program, or part of it, were converted to ASCII, and then re-tokenized, the meaning of the code can change. There are probably hundreds of situations where this will occur, and simply EDITing a line, even if you don't change anything, can do the damage. An example of such a line is:

```
10 IF S = T AND U = V THEN W = X
```

After compression, it would be:

```
10 IFS=TANDU=VTHENW=X
```

This causes no problem until, for example, the program is SAVED in ASCII. When reloaded, BASIC would see (Blanks and ?? added for clarity):

```
10 IF S = TAN ?? DU = V THEN W = X
```

BASIC will misinterpret this line, believing that the keyword TAN is incorrectly used.

Bill's approach to deleting REM lines only goes halfway to doing the job correctly. An example of coding you will see time and time again follows:

```
10 GOSUB 1000
20 END
1000 'THIS IS THE CALCULATION SUBROUTINE
1010 A=B+C
1020 RETURN
```

In this case, if line 1000 were deleted, the BASIC program would be broken. The complete solution is to analyze the entire program and determine which lines are referenced by other lines, and not to delete referenced lines. Numbers which follow ELSE, THEN, GOTO, RUN, RESTORE, GOSUB, RESUME, LIST, LLIST, DELETE, and ERL tokens are line number references. This is a lot of trouble, and a much easier solution is not to remove the

entire line, but to remove only its contents. This results in saving five fewer bytes per line, but eliminates the above problem.

Bill's code also does not take into account the potential problems in compressing FIELD statements. The pitfall here is that the AS keyword is *not* tokenized, but remains in the program in ASCII. An example of a dangerous FIELD statement is: 10 FIELD 1, 2 AS C\$

If the blank is removed between the AS and the C\$, the interpreter will incorrectly read it as ASC, another keyword. The easiest solution is to leave FIELD statements alone.

A word of caution is in order for anyone who might attempt to implement Bill's suggestion for further processing which involves consolidating lines: You can not merge a 'referenced' line into the preceding line, so it will be absolutely necessary for you to perform the comprehensive analysis described above to determine which lines are the target of referencing statements.

Robert F. Snapp, President
Snapp, Inc.
Cincinnati, OH 45242

Light Pen

A number of people have been writing to us lately to ask if we still sell the Light Pen and Light Pen kits which were described in "Build a Light Pen," April 1980, *80 Microcomputing*. Please tell your readers that we are still gladly shipping both assembled Light Pens (\$29.95) and Light Pen kits (\$19.95). We are very sorry to say that we cannot sell individual components used in building the Light Pen, but we consider the kit at \$19.95 a very good value. Thank you for your fine publication.

Wayne Holder
Oasis Systems
San Diego, CA 92103

Two-chip ROM

Ever since the Model I two-chip ROM came out I have been watching for installation hints but have not seen any. Therefore, my experience may be of value. For the newer "G" printed circuit boards the proper ROM Level II kit is part number 263-1120.

The new ROM marked "NEC K01049-004" goes in the ROM A position marked Z33 on the printed circuit board, and the ROM marked "SCM 91609P" goes in the ROM B position marked Z34 on the board.

The DIP shunt in socket Z3 is replaced with the new one provided in the kit, but it must be programmed first. All connections remain intact except for the pin 1 to 16 connection which is opened for the 16K RAM configuration.

That is all there is to it, except you should take the normal precautions when handling CMOS ICs (i.e. ground the circuit board, yourself, and the IC insertion tool). Make sure the ROM and the DIP shunt are properly oriented as well.

So far I have had no problem running old Level II tapes with the new ROM.

Ronald O. Anderson
Dayton, OH 45431

Programmer Review Notes

In reference to the review of our program "Programmer" that appeared in the January '81 issue of *80 Microcomputing* I would like to make two statements:

- (1) The bugs reported by Mr. Thurlow have been corrected; Programmer is, so far as we can tell, completely free of bugs.
- (2) Anyone owning a copy of Programmer, version 1.6 or earlier, can obtain a new, bug-free copy without charge by returning their original to Rational Software along with their name and address.

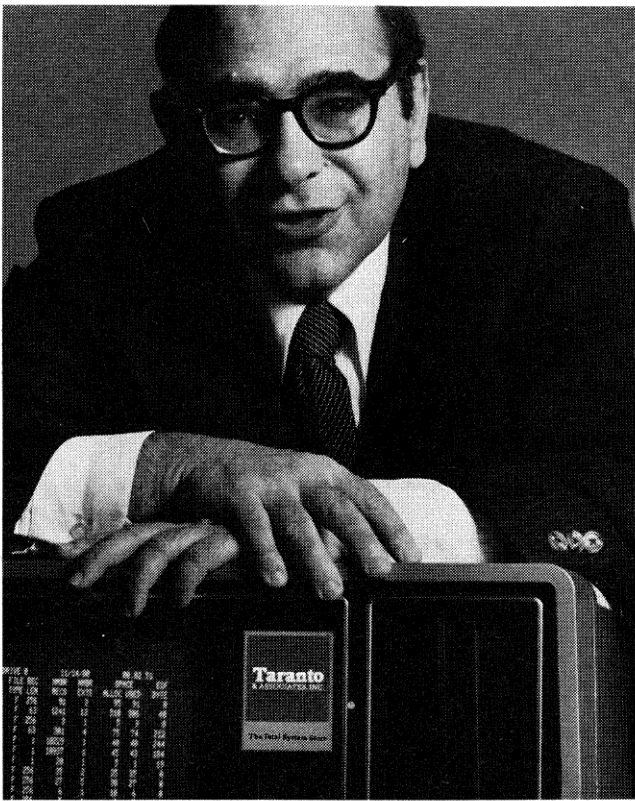
Tom Little
Rational Software
963 E. California Blvd.
Pasadena, CA 91106

CMD Functions

The following CMD functions are available on Model I TRSDOS 2.2 and 2.3. (Don't call Ed Juge, just try them.)

1. CMD"E" Display most recent disk error
2. CMD"#"># Display MICROSOFT copyright notice
3. CMD"A" Same apparent function as CMD"S" but goes through 4030 whereas CMD"S" goes through 402D and 4400.

TRSDOS 2.2 and 2.3 also allow for relative record random access with records smaller than 256 strung into 256 byte blocks. When asked "How Many Files?", reply nV. This will allocate an extra 256 byte buffer for each file. Note that this will reduce your available memory. To open a file for short record access, OPEN "R",n, file descriptor, record length. GET and PUT will then operate on a relative record



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Model II when it's not sold through the Radio Shack). If it fits your needs better, though, we'll get the disk drive or the line printer somewhere else.

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Some serious advantages.

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In a lot of cases, we can help you set it up, too. I'm putting a group of authorized dealers together. Before long, they'll be all over the country, able to bring the equipment and programs right to your business. They'll spend a day or so with you helping you shake it down. It'll cost a little more, but it's good insurance.

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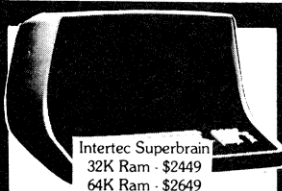
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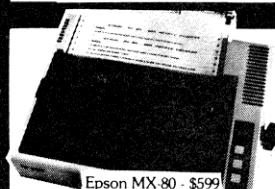
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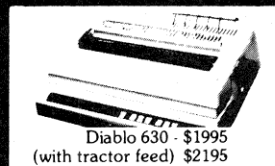
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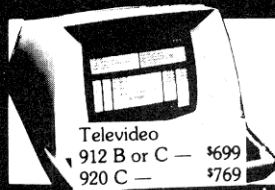
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Telex: 952106



128 = green
144 = yellow
160 = blue
176 = red
192 = buff
208 = cyan
224 = magenta
240 = orange

The pixels are numbered: 28/4
2/1

To determine what code to use, first determine the color's number from above, add the number(s) of the pixels you wish to set and you have the code to be printed (i.e., to set the upper left corner to red, the code would be 176 for red plus eight for the upper left corner, or 184). Using graph paper and colored pencils, plot your graphics and compute their codes, turn on your Color Computer and put them in data statements.

The start of variable storage is at 27D and 28D and the end of variable storage is at 31D and 32D. If you haven't guessed by now, we're going to start packing strings.

Determine the names of the variables you will use for your graphics. Here's my program to pack strings. If you are adventurous you could do all your strings at once.

```
10 AAS$="AAAAAAAAA": 'or whatever
1000 X=PEEK(27)+256+PEEK(28): 'start of variable
    storage
1010 W=PEEK(31)+256+PEEK(32): 'end of variable
    storage
1020 FOR Y=X TO W: 'all bytes in variable storage
    area
1030 IF PEEK(Y)=65 AND PEEK(Y+1)=193 AND
    PEEK(Y+2)=10 THEN V=Y+4 ELSE NEXT Y:
    'if both letter and the length are correct you have
    a hit
1040 L=PEEK(V)+256+PEEK(V+1): 'actual address
    of string
1050 FOR Y=L TO L+9: 'loop to poke codes
1060 READ A: 'get code
1070 POKE Y,A: 'shove it in
1080 NEXT Y: 'do it again
1090 PRINT AAS: 'check it out
1100 END: 'done
9900 DATA: 'store your codes here
```

There it is; simple enough. I like my Color Computer, and when Tandy releases more information, it will be nicer still.

*William Sias, Vice President
REMarkable Software
Muskegan, MI 49443*

Radio Shack and Model I

In view of my letter voicing strong criticism of Tandy's level of customer support from Fort Worth, and equally strong remarks about the computer store in East Hanover, New Jersey, which you published earlier, I would be remiss and irresponsible if I did not again take pen (or

Script) in hand, to state publicly that there has been a vast improvement in customer service at both locations.

The first improvement is that I can get through to Tandy on the 800 line. The next improvement is that I am answered by somebody both courteous and knowledgeable, and if this individual is unable to answer my problem, he usually follows up with a note or piece of printed material.

The present management of the computer store in East Hanover is courteous, professional, patient, and extremely helpful. The service department similarly demonstrates a professional attitude and a prompt response, both on the telephone and with respect to carry-in equipment. In my opinion it is quite unusual to see such rapid changes in attitude and efficiency in a large company, and the management of Tandy and of the East Hanover store deserves to be congratulated on their rapid response to customer needs.

On another note, I was somewhat taken back by the sudden withdrawal of the Model I from the marketplace. My own plan had been to develop office uses for the microcomputer and to put them on line one by one, with a dedicated computer system at each operating station, rather than working on a larger main frame. I intended to use the Model I because of its modular arrangement. This cannot be so easily accomplished with the Model III, where the basic unit with disk drives costs almost \$2,500, and the keyboard, screen expansion interface and two disk drives are not modules, but are one unit which all must be taken in together to the repair shop. I feel that we are losing something by the more handsome integrated package which the Model III provides.

*Robert A. Goldstone, MD
Paterson, NJ*

Missing Drives

Radio Shack boasts that it delivers what it promises. When I bought my TRS-80 three months ago, they promised the disk drive "would be out soon." Indeed, today it is out, but it is not available to customers like me who have already bought our TRS-80 computers and ordered the disk drives separately.

I invested several thousand dollars in the Radio Shack Computer, printer and some programs. In order for my investment to be useful in any way I must have the disk drive capacity to operate the programs I need for my business.

I feel I purchased the Radio Shack under false pretenses. My back order for the disk drive is more than 90 days old and no

one can tell me when it will be filled. Yet, I am galled each time I see a new TRS-80 complete with disk drive on the shelf ready to ship to any person who has not yet made an investment in Radio Shack equipment.

I hope other Radio Shack customers in a similar predicament will write to the president of Tandy Corp. as I have done. Perhaps with some pressure, Radio Shack will deliver on its promise.

*Barry D. Mason
Los Angeles, CA 90069*

Radio Shack Responds

Mr. Mason should be able to get a disk kit installed through his local store in very short order. Although the repair center could be out of stock, they should be able to get him one in a matter of three to four days at most.

Drives were a little slow in coming through for us, and when they were scarce, we had to commit the majority of them to computer systems where the majority of the demand was.

Drive kits should be readily available with little or no wait on a continuing basis. At least we won't see the six month backorder conditions we had in the early Model I days. I'm sorry for any inconvenience Mr. Mason experienced.

*Ed Juge, Director
Computer Merchandising
Tandy-Radio Shack
Ft. Worth, TX 76102*

Program Compression

We really enjoy reading Bill Barden's column, "The Assembly Line." His kind of creative thinking helps keep us on our toes. We found his program for compressing BASIC source code (Jan '81) particularly interesting, since it parallels a recently completed development project by our staff. Bill is absolutely correct, in that the process of correctly compressing BASIC source code does not lend itself to a 'short and easy' solution. Since we invested about 250 man hours in this project, we thought we would pass along to your readers some of what we learned in the process.

Bill's concern for keeping the forward chain pointers accurate as he compresses the source code is admirable, but more work than necessary. There is a ROM routine (which I don't think is ever used, except by Disk BASIC) which will reset all the chain pointers so they accurately contain the required forward chains. The call

80 DEBUG

CAL81

Reference my CAL81 program on page 128 of the December, 1980 issue of *80 Microcomputing*: I have received several letters about problems and I would like to clarify a point. Be careful when keying in lines 1570, 1600, 1640, 1960 and 2130 because the numbers in the data statements are carried on to the next line. For example, the 1 in line 1570 mates with the 0 in line 1580 to make the number 10 and not the numbers 1,0. You must have an even number of numbers between the 1's (which signal end of line). If you do not, this may lead to the (almost) famous illegal function call in 1530.

John F. Strazzarino
1500 Dundee Dr.
South S.F., CA 94080

The Third Dimension

In my article, "The Third Dimension 3-D Tic-Tac-Toe" in the July, 1980 issue, an inadvertent error has been found. It permits easy wins because the computer fails to check certain winning combinations.

This was brought to my attention by Irwin Eckert of Warren, MI. He pointed out that two of the pointers in the D1 array are reversed. This is easily remedied by editing the following lines and changing each 53 to 54 and each 54 to 53: 5020, 5040, 5100, 5130(2), 5160(2), and 5190.

Without these changes, there are eight entry positions that are not checked properly by the computer for possible winning combinations.

D. R. Dillehay
107 Ashwood Terrace
Marshall, TX 75670

Holiday Cheer Bug

Concerning the Address List Program published as part of my article "Holiday Cheer" in the December, 1980 issue:

On page 134 a line has been omitted

which must be distressing novice programmers: 3110 CLS: II = I.

The program will obviously seem not to operate without this line, as a list retrieved from cassette will not be able to be displayed on the CRT.

Norman S. Kerr
1571 Burton St.
St. Paul, MN 55108

Serial Clank

The article "The Serial Clank on the Printer" by William O'Brien (Oct. 1980) has an error in the BASIC program data on line 100. The number 248 should be inserted between 230 and 246. This will eliminate the message "Out of data in line 50."

The assembly listing (number 3) has the top part and the bottom part of the listing exchanged. This might lead to some confusion as well.

Theo. F. Staniec
Des Plaines, IL

Level II ROM Mysteries

Reference: "Mysteries of the Level II ROM" in the December, 1980 issue of *80 Microcomputing*: There were several typesetting errors in the article. The major errors are:

Near the end of the second paragraph on page 150, the pointers referred to are line pointers.

Near the end of the fifth paragraph on page 150, "two-byte addressed jumps"—"the two-byte jump addresses."

On page 152, the reference to Program 3 should be to Program 4. On page 156, the reference to Program 4 should be to Program 5, and the reference to Program 5 should be to Program 6. On page 158, the reference to Program 4 should be to Program 5.

At the top of page 158, "beginning of any program" should be "beginning of any program *line*," and "positioning the program pointer" should be "positioning the beginning-of-program pointer." In the second paragraph on page 158, "position of the table"

should be "relative position of the table (with respect to the end of the program)."

The specifications and usage notes under Program Listing 4 should be under Program Listing 5. The specifications and usage notes under Program Listing 5 should be under Program Listing 6.

A section of Table 4 was omitted. The part of the table from "Double Prec. Number" to "Numeric or String Array" should read:

| | | |
|----------------|---------------|--|
| <i>Double</i> | <i>Prec.:</i> | byte 1—identification |
| <i>Number:</i> | | code 08H |
| | | byte 2—second character of variable name |
| | | byte 3—first character of variable name |
| | | byte 4-11—double precision value |
| <i>String</i> | | byte 1—identification code 03H |
| | | byte 2—second character of variable name |
| | | byte 3—first character of variable name |
| | | byte 4—string length (0-255) |
| | | bytes 5-6—location of first character of string (LSB, MSB) |

Victor Griswold
20 Fieldcrest Dr.
Jackson, TN 38301

Z-BUG Spaces

I especially enjoyed assembling and debugging Z-BUG, Jan. 1981. All the bugs were my typing errors, except line 406, page 160 which needs an additional seven spaces inserted just after 'Registers Addr(), so the rest of listing 1D will assemble correctly.

Richard Musick
1426 Oakbrook
Lancaster, TX 75134

Kitsz Column

Eds. Note: The Program Listing captions in the February "80 Applications" (page 40), were inadvertently reversed.

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80AID

Upper/Lowercase Troubles

Purchasers of an upper/lowercase modification from Radio Shack received with it a program tape containing two versions of a software driver for the upper/lowercase mod. On one side of the tape is ULCDVR/CMD for those who are using their Model I with disk. On the other side is ULCBAS for those who use the lowercase mod, with Level II BASIC.

The instructions don't say that after this program is loaded and sets and protects its own memory size, the user is prevented from loading and using any other utility programs. Expanding the protected memory doesn't change the fact that "ULCBAS" has somehow write-protected the protected memory so that even a direct POKE statement cannot implant a value in an unused location within that area. One obvious solution is to buy a disk drive and TRSDOS, as this problem doesn't exist with TRSDOS.

My problem is that in order to use my printer, I must run a software driver which is fully relocatable and is POKEd into high memory from a BASIC program which then self-destructs. So, I must settle for upper/lowercase or use of my printer.

Neither calls to my local computer center nor calls to Fort Worth have yielded a solution. Those I have talked to have tried to help, but just don't know what to do about it, short of buying a disk drive and TRSDOS or other DOS. Eventually I will, but for now that just is not practical.

I must not be the only user to have encountered this problem. I might add that my knowledge of assembly language is zilch. Therefore, debugging or modifying ULCBAS or my own without step by step instructions is out of the question.

A solution would be most welcome.

Joe Brandiner
426 Grace St.
Pittsburg, PA 15211

Line Printer I

Here is a fix for owners of the Line Printer I (Centronics 779) that have skipping problems. Change R24 on the circuit board, which is an 18K 1/4W resistor with a 39K 1/4W resistor. Refer to the Service Manual that comes with the unit in locating R24. It is somewhere near ME2.

Domingo S. Ang
IC Systems
Manila, Philippines

Binkhurst Aid

In response to Michael Binkhurst's call for help ("80 Aid," February, 1981), I sent him a letter stating the following solutions:

You want to expand the character display to 80 characters per line. This would require major changes in the video drive circuitry and probably a new character generator and more video memory. While these modifications are possible, they would be very complicated to construct and expensive to build; also, since it would not be a Radio Shack approved modification, you could run into major repair bills if you ever returned the computer for repair (I had to pay over \$80 for a repair because of a lowercase mod I installed which was not the cause of the problem).

The problem with the program line is easier to explain, but almost impossible to fix. The problem with the line is the way the computer handles the numbers. When a number is stored, it must be converted to binary: 0.01 cannot be accurately represented in binary; the bits would eventually repeat after about two bytes. When the integer portion is large, the display routine will print the number apparently correctly; when the integer portion is removed, however, the inaccuracy may show, as it does here. The only possible way to correct this is to round off the result to two places after the decimal point, either by $\text{INT}(X \cdot 100)/100$ or

$\text{PRINT USING "####.##";X}$, where X is the result. There is no problem when using the value, though; it will be as accurate as possible.

Joe Sewell
6776 Sheridan Rd.
Melbourne, FL 32901

Solid Graphs

The January issue has an article on histograms: "Get High On Histograms" by Daniel Lovy (p. 211). If you use the program as written you get an open graph. However, if you own a printer which prints graphic characters, you can produce a solid graph by changing line 1280 from:

```
1280 IFPOINT(ZP,Z+3+ST)=-1 THENA$(Z)=A$(Z)
+ " " ELSEA$(Z)=A$(Z) + " "
```

To:

```
1280 IFPOINT(ZP,Z+3+ST)=-1 THENA$(Z)=A$(Z)
+ CHR$(191) ELSEA$(Z)=A$(Z) + " "
```

Carl Reek
11624 NE 74th
Kirkland, WA 98033

Telex Messages

I would like to obtain information on how to go about using my TRS-80 to send messages to a Telex Machine. I have a TRS-80 48K, one disk drive. Any information would be helpful.

Rick Thompson
Box 2617
Grand Forks AFB
North Dakota 58205

Interface Aid

I am looking for information about how to interface a Control Data Corporation Impact Printer, Type 0769-06-00 to a TRS-80?

I am willing to pay for the cost of copying any materials and/or postage needed for this information.

Jon Presley, WD0EAO
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|-----------------|------------|--------------|------------|
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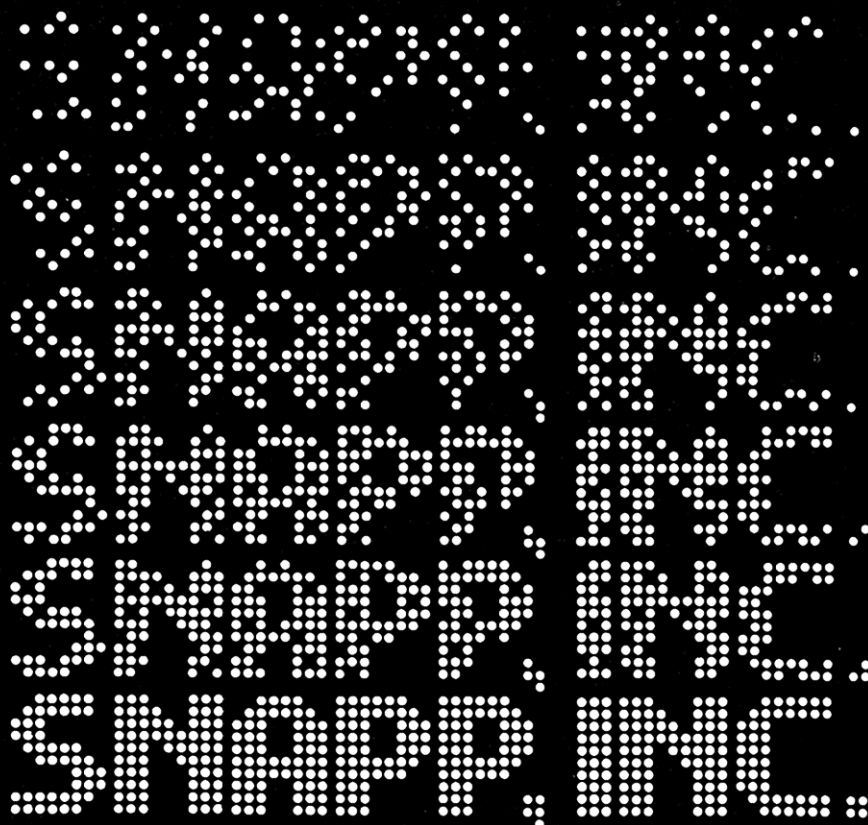
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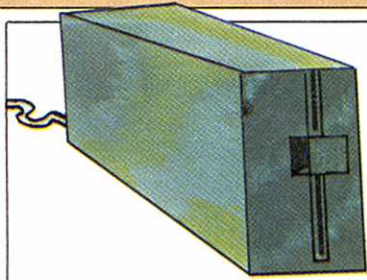


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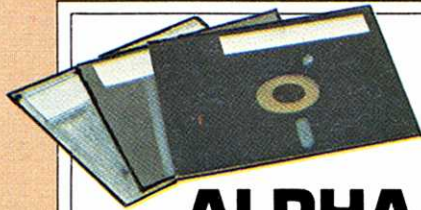
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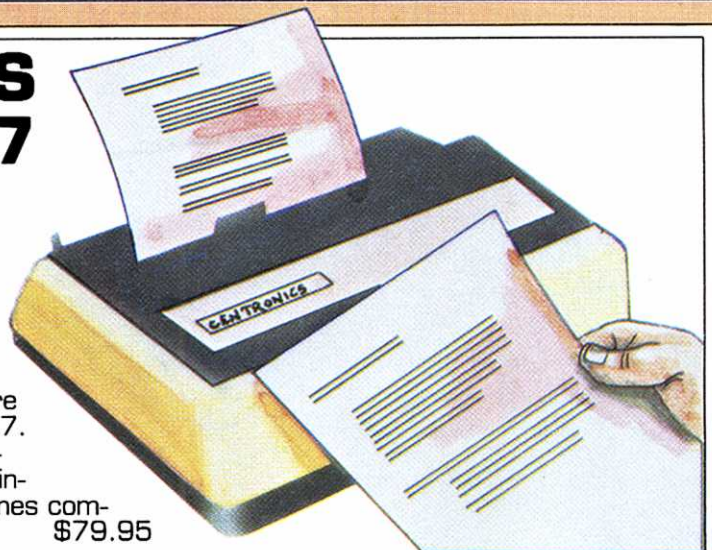
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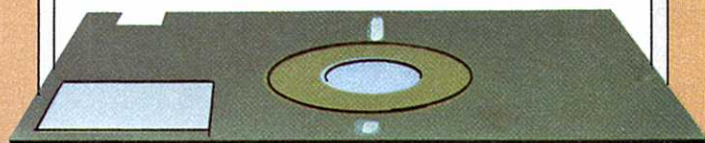
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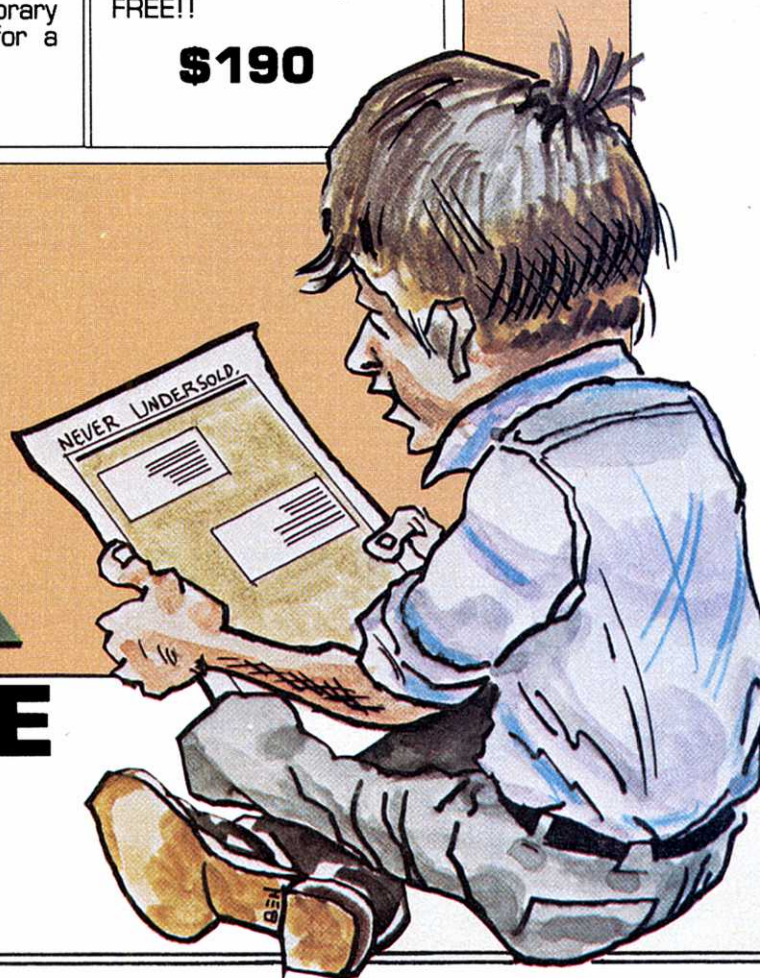
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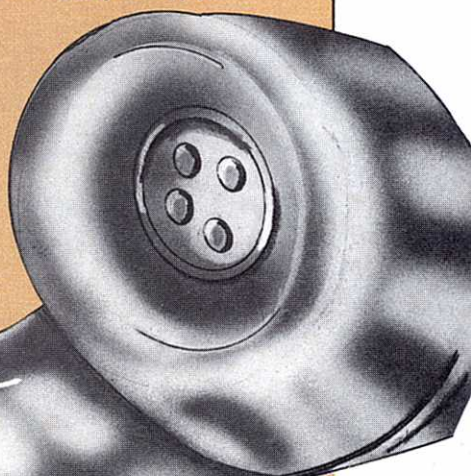
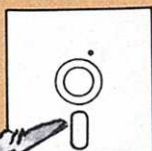
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80 REVIEWS

Edited by Pamela Petrakos

"We are not inundated with technical information. We learn how and why the machine does what it does."

Pascal

Paul M. Chirlian
Matrix Publishers, Inc.
Interscholastic Book Service
Forest Grove, OR
Softcover, 211 pp.
\$9.95

by Dennis Thurlow

Pascal Spoken Here! You see it on T-shirts, bumper stickers, and store windows. Recent magazine polls indicate that it may soon be spoken everywhere!

The phenomenal growth of this language is due, at least in part, to its incredible flexibility as a structured language. Syntax is kept to the barest minimum, which is a help to the novice.

Grasping the Basics

Professor Chirlian has made every effort to keep this textbook simple. The professor explains how a computer works, how to use a flowchart, and the differences between working from a terminal and preparing a program for a batch operation. Debugging is well covered, as well as the idiosyncrasies in the language as it is used in different makes of computers.

Once the basics of programming in any language are grasped, understanding a new language involves only recognizing limitations and syntax.

The book is loaded with syntax flowcharts so the experienced programmer can quickly skim through them. The limitations of the language are found in the text, but an index makes the job easier.

The teacher's edition includes answers and example solutions to problems provided at the end of each chapter. ■



The Creative Kid's Guide to Home Computers
Fred D'Ignazio
Doubleday & Co., Inc.
Garden City, NY
Hardcover, 130pp.
\$9.95

by Chris Crocker
80 Staff

To a novice, the computer is at first nothing but a toy. Getting beyond that stage is the trouble.

The Creative Kid's Guide to Home Computers is a good starting point. D'Ignazio attempts to take you beyond the fun-and-games stage with a computer. He inspires you to become more than just a user.

A caution: This is not a how-to book. It is, as D'Ignazio says, a "What if?" book—

a creative guide.

"What if?" asks D'Ignazio. "What if I did my math homework on the computer?... What if I composed my own music?... Used it to draw a picture?... Used it to help a friend of mine who's deaf?"

A Whirlwind Tour

The book is divided in four sections. The introduction develops a cursory understanding of how microcomputers work. Here D'Ignazio teaches us some vocabulary, and talks about what a computer is, and how to make it work. It is, as he calls it, "A Whirlwind Tour." This is where the book proves itself. We are not inundated with technical information. We learn *how* and *why* the machine does what it does.

The next section is entitled "Games." Here we learn about the many computer games (including both the hand-held and the microcomputer) available. While we

57 Practical Programs and Games in BASIC
Tandy/Radio Shack
Ft. Worth, TX
Softcover, 204 pp.
\$3.95

by Marilyn Ferris

When I purchased my TRS-80, the salesman recommended this book. There is nothing more disappointing than to have a new computer and have nothing to do with it.

Certainly one can buy the various programs on tape, but it would quickly run up a bill. Eventually, I hope to write my own programs.

57 Practical Programs and Games in BASIC is well organized and written. Each chapter begins with formulas and a flowchart or diagram. A sample run lets you see what the program does, and then gives the program in BASIC.

At the beginning of the book, the author lists all the BASIC statements that he uses. My Level II BASIC has them all and I

suspect that they can be translated easily to other versions.

Although there is a good selection of programs, the author fails to organize by subject in his index. The book only offers two rather simple financial programs, a compound interest program and a depreciation program. I would have preferred the inclusion of more comprehensive programs, however, the ones included can serve as guides to writing your own. There are also programs that do simple electronics calculations.

The games programs intrigued me and served as an easy introduction to computing. I don't think these programs compare with the more expensive cassette versions but the price is right.

My only misgiving is the typing in of 133 lines for the first Space Wars game, or worse yet, 287 lines in the second version.

I found this book useful. It allows me to use my computer right away and gives me models to base my program writing on. My complaints are: an inadequate index, and the lack of extensive financial programs. However, I recommend this book to anyone new to microcomputing. ■

read about all of these fun and exciting games, we stumble upon a chapter entitled "You're Trapped!"

And we are. D'Ignazio led us right into it. The program "Trapped!" is a simple BASIC program listed opposite a flow chart. The program demonstrates commands such as RANDOM, PRINT, LET, INPUT, IF, GOTO, GOSUB, FOR...NEXT, END and RUN.

The listing is set up with guidelines which describe what each section of the program does. D'Ignazio uses a game to help us learn BASIC.

The next section, entitled "Projects," is about other possible uses for the micro-

computer, from robotics to aiding the handicapped.

None of the projects are particularly simple. However, even some of the most complex, such as those in robotics, are projects that have been done by teenagers and high school students.

The final section, the appendices, lists a limited number of books, magazines and catalogs, a checklist for the first-time computer buyer, an ASCII coding chart, a decimal to binary chart and a glossary.

I'm not entirely sure of what grade level D'Ignazio is trying to reach with this book. It seems too complex for most grammar school students (but not for a grammar

school teacher). At times, it seems too simple for adults.

I found most of it to be enjoyable reading, however, and I think that it could be used on the junior high and high school levels, as well as for beginning adults attempting to understand the microcomputer. "Kid's," then, is perhaps a misnomer.

The Creative Kid's Guide to Home Computers is not the be-all and end-all microcomputer resource guide. D'Ignazio is telling us that microcomputers are not answer machines, "they are tools to help you build models." This is, as I said, a starting point—and a good one. ■

Master Directory 1.1
Micro Systems Software
Hollywood, FL
\$29.95 on disk

by James B. Penny

Programs written for the TRS-80 seem to be getting better all the time. The program MASDIR 1.1 from Micro Systems Software in Florida seems to be one of the goodies. All of my disks and files are now organized so that I can find what I want without a hassle.

The program, as furnished, requires one or more disk drives. It doesn't seem to care how much memory (above 16K) you have in the system. It contains its own bootstrap routine and operating system. When loaded, the program begins with a date query. The date entered is appended to all directory files entered in this particular session. This date is also used in the heading of the printout, if one is requested.

After the data entry, the program menu will allow you to enter numbers 1 through 9 or the single letter E (EXIT). Even though the documentation doesn't indicate it, your first entry should be number three or READ DISK DIRECTORY. Obviously, you must put something on the disk in order for the program to have something to do. The E is the only orderly way to close files and exit the program. Removing the diskettes before exit by the E command could cause a disaster.

A single disk drive system requires that you do some disk swapping, while a multiple drive system will read the directory information off the diskette contained in drive number one. The program is smart enough to know how many drives are available, and will prompt you accordingly.

You must now enter the number as-

signed to the target diskette. This number may be subscripted with the letter A, B or the command -I. Subscript letters may be used to indicate a diskette side (if you use both sides of your diskettes) or they may be used to differentiate between master and backup diskettes. The latter is probably what the author had in mind, since only the B subscript is printed in the listings. The -I command causes the system to read and list files with the invisible attribute.

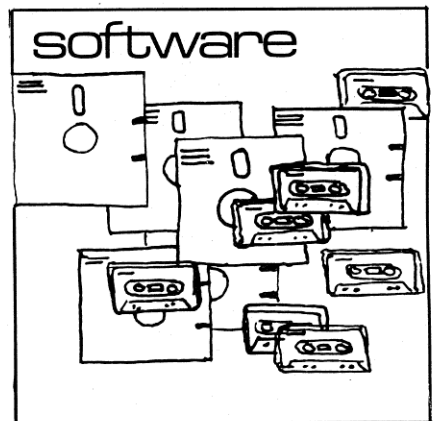
The number of diskettes and the total number of files entered are tallied in the upper right hand corner of the screen. Once entered, the directory entries may be recalled to the screen or printer in one of the following formats:

- Individual diskette directory, by assigned diskette name or number.
- Master listing of all diskettes in numerical order.
- Master listing of all files in alphabetical order.
- Listing of all files with a common extension (e.g. /CMD).

In addition to the above, you may perform a search for a particular file by name. The program responds by listing every occurrence of that file. You also get lots of other data such as program length in granules, file type, protection level, etc. The search feature is enhanced by allowing the use of the question mark as a "wild card." The search entry of B??????? will list every file beginning with the letter B. Another search feature will also locate diskettes which have more than a specified number of free granules.

Of course, you may add or delete diskette directories at will. It seems that these folks thought of everything. Well, not quite. Here's the bad stuff:

- There is no way to annotate files with



your own file description.

- There is no provision for anything other than the standard Radio Shack parallel port printer.
- There is no provision for modifying the internal print format in case you want other than 66 lines per page.
- Some directory files written by NEWDOS 80 cannot be read or listed by MASDIR.
- MASDIR 1.1 won't read directories formatted for CP/M.

However, directory files written by NEWDOS 80 can be read and listed if you make use of SUPERZAP which, fortunately, comes with NEWDOS 80. Change relative byte EC (Hex) in MASDIR relative disk sector 13 (decimal) from the current value of 40 (Hex) to 00. This ZAP fixes the directory read problem but, at the same time it changes the action of the -I command so that it picks up all of the system files along with the invisible files.

Also if you write your own print driver and formatter that solves another problem. Relative bytes 3F to 4D (Hex) in relative sector 3 are used to locate top of memory. The next three bytes store it at the address 4C1D (Hex). You can use these byte locations to protect memory for your printer driver and/or load the stan-

dard printer DCB (at 4026H) with the address of your driver. Relative sector 13 (Hex), bytes 72 through FF (Hex), are not used by the program. They will load into memory, on boot, beginning at address 5372 (Hex). You can use this space for your printer driver if you are careful. While you are zapping away in there, you might also correct the word "CATEGORY" found twice in the program.

The formatting problem also can be dealt with. The byte 3D (Hex) at relative sector 4, relative byte AA (Hex) gives the number of lines plus one (in Hex), which will be printed before each new page

header is printed. A form length of 66 lines is set by relative byte 5 in relative sector 3.

All Things Considered

The program author makes extensive use of lowercase characters in the ASCII parts of his program. You may want to subtract the necessary 20 (Hex) from these character bytes if they drive your particular printer "up the wall." Some of these print as control characters in typical Radio Shack fashion, due to the missing bit.

All things considered (even the painful modifications described above), MASDIR

1.1 is one of the most useful programs in my entire library. My copy of MASDIR 1.1 currently holds listings for 108 diskettes and 860 files. With that many files, additions and deletions of file directories gets a little slow because of all the sorting going on. Once stored on disk, however, the display or printing times are perfectly acceptable.

At every computer session, the first and last program used is MASDIR 1.1. First, the program is used to find the file that I want to work on. When finished, I delete and re-enter the diskette(s) which I have updated during the session. ■

VARKEEP

Jim Stutsman

The Circle J. Software Ranch
Carrollton, TX

\$29.95 cassette + disk

by Tom Andrews

Here's a typical situation: You have worked hours, developing an elaborate symphony of a program (complete with lots of arrays containing precious data) then, suddenly, an error message appears on the screen and you find yourself automatically thrown into Level II's editor.

The trouble is probably some little bug you can repair in just a few seconds, but you realize dolefully that editing the program will also erase the data stored in all arrays and variables. You'll have to start your program run all over again. Frustrating, isn't it? If all this sounds familiar, hang on friend, because help is on its way! It's called VARKEEP, and it's like giant relief for a very bad headache.

VARKEEP is the brainchild of Jim Stutsman, who is also responsible for Percom's reliable TRS-80 disk operating system OS-80 (formerly Microdos). The author calls VARKEEP a utility, but it is really an incredibly powerful extension of BASIC, that works with either cassette or disk. With VARKEEP, annoyances that have sometimes made Microsoft BASIC frustrating to use simply disappear. VARKEEP also adds powerful new features to Level II's already impressive arsenal.

Using VARKEEP, it is possible to do many things without affecting data stored in arrays and variables. VARKEEP makes it possible to delete an array during program execution to gain memory without destroying data stored in remaining arrays and variables. VARKEEP makes it

possible to instantly zero or null an array without time and memory consuming FOR-NEXT loops. Even more amazing, with VARKEEP it is now possible to do the unthinkable: String space allocation can be changed on the fly, during program execution, with all stored data preserved without change. This is a great help when a program presents a varying need for string space.

Besides all the goodies just described, VARKEEP provides one additional feature that is (by itself) worth the price of admission. With VARKEEP, true program chaining is possible. Using cassette or disk, programs can be moved in and out of RAM without disturbing stored data. This multiplies the power of the computer by making possible elaborate systems of related short programs that use a huge data base stored in RAM! Every one of the features just mentioned is useful and powerful. With all it will do, it's amazing that VARKEEP occupies little more than 700 bytes!

VARKEEP differs from most other machine language programs because it resides in low memory. The loader program is a bit unusual as well. Written in BASIC, the loader quickly pokes VARKEEP into RAM just above whatever else has been loaded into low memory, including BASIC, and any other low memory programs including the disk operating system. VARKEEP is fully compatible with every available DOS.

Loading VARKEEP is easy. The loader program is simply brought in from cassette or disk, and run like any other BASIC program. A display is presented on the screen with a copyright notice, and a flashing asterisk "comfort" display to indicate that something is indeed happening. Within a few seconds, VARKEEP is installed and the loader, having done its job,

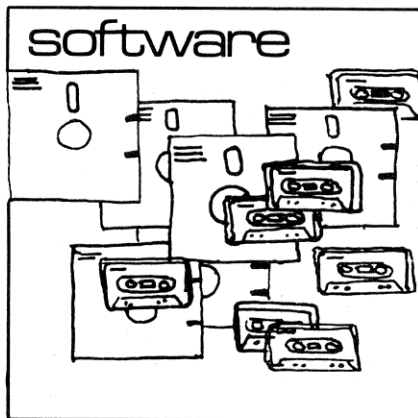
modestly erases itself. It can also be set up to immediately chain in another program from cassette or disk. It's all so very neat and quick that I have set up my system so that it always loads in VARKEEP from disk, immediately after booting in DOS.

Once loaded into memory, VARKEEP becomes an integral part of BASIC. VARKEEP commands are invoked through the NAME vector, which is already built into the Level II ROM. Of course, this means that with VARKEEP in residence, it is impossible to use BASICR in TRSDOS 2.3 without first saving the affected BASIC program, and re-entering DOS. I believe most users will find this an acceptable trade-off because VARKEEP will always be used more frequently than the renumbering feature of BASICR.

VARKEEP has four commands: NAME-SAVE, NAMERESTORE, NAMEDELETE, and NAMECLEAR. All VARKEEP commands can be invoked from the command mode, or as part of a BASIC program. The documentation is excellent and the commands are simple to use. After using VARKEEP only a few hours, I found myself asking, "how did I ever program without it?"

VARKEEP has saved me hours of frustration. The ability to edit program lines without demolishing data has greatly reduced program development time, and markedly reduced the need for driver programs to load and test data. The ability to chain from program to program has permitted previously impossible program systems.

In my opinion, VARKEEP is essential for any serious TRS-80 programmer. In many applications, it easily doubles the power of any Level II or disk machine. I think other 80 readers may find VARKEEP the answer to their prayers. In fact, I think it would be selfish of me not to share the good news. ■



Aids II
\$49.95 Model I
\$79.95 Model II
Aids III
\$69.95 Model I
\$99.95 Model II
Meta Technologies Corp.
Euclid, OH

by David E. Wareham

About five months ago, after taking over the job of bringing an insurance agency on line, I discovered a genuine need for a data base management system. My company had already spent over \$2,600 for a custom written billing program, and we didn't want to spend a lot of money for the further software needs of the company. At that time, we were using a TRS-80 Model I with 48K, three drives and a Line Printer III. I had been using this computer at home for about two years prior to bringing it to work.

We needed to input, store, and retrieve data for report forms, mailing lists and labels. Primarily, we needed to write new programs and reuse existing data. After several weeks of trying to define what I needed, I discovered that I needed a program that wrote programs.

After purchasing the mailsort routine from Meta Technologies and finding that it was even better than advertised, I decided to take a chance and order the Aids II system. I had been burnt a few times by purchasing through the mails and it was with some trepidation that I waited for it. I received the Aids II software along with a 36 page manual. The manual was clear and concise with explanations of the various functions of the Aids II system. The disk also contained a sample program that gave me hands-on experience with the system without risking valuable real data.

As the weeks went by, I created a number of programs with the Aids II systems. At that time I found a need for more than the original 12 user defined fields.

Meta Technologies came out with Aids III, which upgraded Aids II from 12 fields to 20. There were many other improvements such as machine language sort, search and delete. It also included Maps, which can produce custom reports either horizontally or vertically and a label routine which is so flexible that I am using it for many other uses now. This was what I was looking for.

A few weeks later, Calcs was released by Meta Technologies. It could be used for most any type of numeric manipulation. The combination of Aids III, Maps, and Calcs satisfies my need for a data base management system.

What impressed me most about the Aids system was its flexibility. By changing only a few lines I could write any program I desired and manipulate the data quickly. The machine language sort could sort by any combination of five fields in ascending or descending order, or in any combination. For instance, a mailing list could be sorted by zip code, state, city, name and address. The Aids III system can also save these records by any combination of four fields to enable the user to

create specific data files. Aids III was also compatible with files created under Aids II, so there was no need to re-enter these files.

Territory Book is a system I created for the use of salesmen as a tickler/prospecting system. For example, I am able to split the entire Chicago area by zip code and coding the companies by interest in our product. We presently have about 18 separate programs built on the Aids III system and all of them work perfectly. An example of the savings that can be realized from the Aids III/Calcs system is the fact that I was able to pinpoint an \$11,000 dollar monthly deficit in cashflow by using this system—a substantial savings to any business.

Many data base systems presently marketed run well over \$100 with some of them over \$200. M.T.C.'s price as of September was about \$70 for the Aids III system. The Calcs sub-system is well worth the \$24.95 presently being charged. The Aids III system has out performed the others that I have seen demonstrated. The only thing that they are not offering now is word-processing, which they say will be out in the next few months. The Aids III system is worth every dollar, not only for business use, but also for personal use. ■

Scrip232 (Scripmod)
Small System Software
Newbury Park, CA
\$14.95

by John A. Records

Having trouble using your non-Radio Shack printer with Scripsit? SCRIP232 (also advertised as SCRIPMOD) is a program that customizes Scripsit for use with your serial printer.

When I purchased my TRS-80 I also wanted a printer. At that time Radio Shack's only printer interface was contained in the expansion interface which I couldn't afford. I bought the Small System Software TRS232 Printer Interface instead. The TRS232 is a software driven serial output port for use with the serial printer. I've used the TRS232 with my Integral Data IP-125 printer for about two years with no problems.

Enter disk drives, an expansion interface and Scripsit. The printer wouldn't work with Scripsit, although I was still able to use it with BASIC. I had depressing

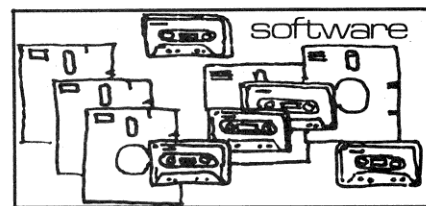
visions of setting up my typewriter next to the computer, with me as the interface.

I first saw an ad for Scrip232 in July, and decided to order it immediately. All in all, it took about two months for delivery of the software. I found the wait very annoying, and I hope Small System Software has straightened out this problem.

Scrip232 was worth the wait, however. It arrived on cassette with six pages of thorough documentation. Scripsit finally worked with my TRS232.

Additionally, Scrip232 is said to add handshake control, automatic linefeeds and characters to the serial driver contained in Scripsit.

Installation is straightforward. Detailed instructions tell the user how to use the tapedisk utility to create a file called Scrip232/CMD. On execution, the program asks eight questions which it uses to cus-



tomize Scripsit to work with your particular printer.

First, you decide whether to modify the uppercase or lowercase version of Scripsit. The selected version of Scripsit is loaded into memory by Scrip232. Next, you can modify Scripsit for use with either the TRS232 or RS232-C interfaces.

If the TRS232 modification is chosen you can select a baud rate ranging from 110 to 4800 baud (I use 600 baud with my IP-125). If the RS232-C modification is chosen, the user enters a "printer ready handshake code," based on the requirements of the printer. The rest of the questions asked by Scrip232 are common to both modifications.

Since some printers require a line feed to advance paper, and since Scripsit sends a carriage return but no linefeed at the end of each line, Scrip232 will modify Scripsit to add a linefeed after each carriage return. Some printers also require null characters after carriage returns to allow time for the carriage to travel, and Scrip232 lets you select the number of nulls transmitted. The documentation encourages experimentation.

Finally, you are given an opportunity to

alter your modifications, and to choose the drive to which the customized Scripsit, now called Scripsit/CMD, is written. Scrip232 can then be rerun, to create different version of Script/CMD for different printers.

After modification, SCRIPSIT WITH TRS232 DRIVER is displayed on the screen area reserved by Scripsit for commands. As far as I can tell, the customized version of Scripsit occupies the same amount of memory as the original. On my 32K computer, both display 16224 CHARACTERS FREE before text is loaded.

After customization, Scripsit functions and commands seem to work pretty much as they were originally intended to.

The documentation contains detailed suggestions on what to do in case of problems. However, I didn't need these; Scrip232 worked the first time.

In summary, I'm very pleased with Scrip232. I think it's a real bargain. Judging by reader letters in the computer magazines, many people are having trouble getting Scripsit to work with non-Radio Shack printers. If you have a serial printer and either a TRS232 or an RS232-C interface, Scrip232 may solve the problem. ■

Wordo

Micro-Fantastic Programming

New York, NY

\$14.95

by Debra Marshall
80 Staff

For all you wordmongers with an affinity for games and an uncontrolled urge to flaunt your verbosity, this is the game for you. A cross between Scrabble, Jumble and Hang Man, Wordo provides more than ample opportunity to test your skill in the five-letter-word category.

Wordo can be played by one or two persons. The program provides the computer with a list of over 1,000 five-letter words, from among which it randomly chooses one word for each play. The player is asked to enter a five-letter guess word. The computer adds this word to the player's list and indicates how many of its letters are also in the game word. It does not indicate *which* letter in your word is contained in the game word.

After each guess, the player is able to enter or eliminate letters known to be or not to be in the game word on the "scratch card" at the top of the screen.

Each play is limited to 30 guesses, after which the word is displayed on screen.

If the player wants to end the game prior to reaching this point, entering the

word "quit" as a guess produces the same result. If the player correctly guesses the game word, Wordo will flash on the screen.

The scoring method is determined by the number of players and is based on either accumulated points or on an average number of words entered per game. The score is carried over and modified from game to game.

Wordo is not a cinch. You'll be surprised at how many five-letter words you don't know, or at least don't commonly use. To win the game, your challenge is to find several words with letters that are not in the game word; this is not always as easy as it sounds.

In desperation, you may be tempted to cheat, as I was. The computer accepts nonsense words that are in the form of true words. It rejects any nonsense word which does not follow an English vowel-consonant pattern. It also rejects any guess word of less than five letters.

Wordo is not geared for children. There is no way to direct the computer to select words appropriate for a child. As a matter of fact, there is no way to direct it to select words appropriate for any adult who has a low frustration threshold, either.

Those of you without that problem will find this game interesting and challenging. veaH fnu! ■

DDT (Disc Drive Timer)

Disco-Tech Microcomputer Products

Santa Rosa, CA

\$19.95 on disk

by Howard M. Berlin

The DDT (Disc Drive Timer) program by Disco-Tech is a versatile software utility for the TRS-80.

It allows the user to check if the disc drives are running at correct speed. DDT then is really a graphic display tachometer. This can be important since one may not be able to FORMAT or BACKUP diskettes if the motor speed is out of range. Incorrect motor speed can also cause data to be lost when loading or saving programs and files.

Disco-Tech's advertisement indicated that DDT is available on cassette tape and diskette. When I phoned in my order, however, I was told that the tape version was no longer offered.

My disk copy came with a well documented 18-page instruction manual. It states the DDT diskette cannot be copied. It is automatically loaded when inserted into drive 0. The system is booted (similar to Microsoft's "Adventure" game).

However, my DDT diskette would not load. I realized it was because of a previously installed speed-up mod that allows my CPU to run 50 percent faster when powered up. To prevent this, I placed the DDT diskette in drive one and booted the system with one of my modified high-speed operating system diskettes in drive 0. For those using any of the advertised high-speed modifications, the CPU will have to be operated at the standard 1.77 MHz clock speed in order for the program to function. For those who have not changed the speed of your TRS-80, the above would not apply.

When the DDT program is executed, it automatically loads BASIC and runs.

The menu selection consists of three basic options: The first option analyzes all the disk drives in your system which are ready. It displays on the video screen the motor speed in RPM and the percentage error from the required 300 RPM speed.

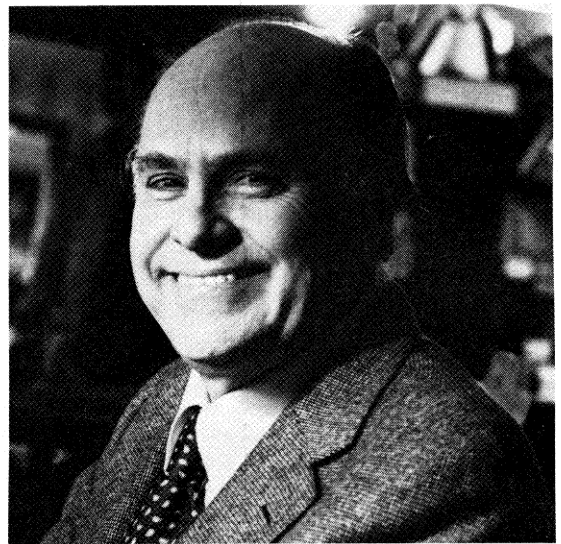
The second option is essentially the same as the first, except that the user specifies the drive to be analyzed.

The last option is the paramount feature which makes DDT so useful as a diagnostic and maintenance software tool. Using this option, a linear horizontal scale is displayed near the bottom of the screen with a graphics block indicating the motor speed of the specified disk drive, which is

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updated approximately once a second.

It is not enough that Disco-Tech gives you software to determine the motor speed of your disc drives. They must also include detailed instructions on how to take your TRS-80 disc drive apart and adjust the speed using only two screwdrivers. If you have purchased non-Radio Shack disc drives, there are helpful suggestions and instructions for adjusting PERTEC, MPI, and VISTA units. They are idiot-proof! All adjustments are made us-

ing the graphic tachometer option which speeds up things.

As I mentioned earlier, the DDT manual states that the DDT diskette cannot be copied, as it has experienced a lot of software pirating (so what else is new!).

Each DDT diskette contains three copies of the program: DDT/CMD, DDT1/CMD, and DDT2/CMD. If one copy of the DDT program somehow becomes damaged, just kill the damaged file and then rename one of the other two copies as DDT/CMD

(pretty good, huh?).

On the other hand, if you really got lucky and messed up the entire diskette, Disco-Tech will replace it for an \$8 handling fee. Anyhow, after a little experimenting I was able to copy the DDT diskette so that the clone runs exactly as advertised. Sorry, I can't share the secret with you.

If you want to save some money as well as time, the DDT is a worthwhile investment. ■

Ultra-mon
Interpro
Manchester, NH
\$24.95 on cassette

by Dennis Thurlow

Radio Shack has been blasted quite a bit recently, however, there are two excellent products from their computer division. One is the Level I BASIC Manual and the other is the DOS monitor DEBUG.

DEBUG's display of the Z-80 chip structure was a mystery to me, but once I got used to it, I found it indispensable. It's also free! I was determined to write an article explaining its wonders. Then before I got to writing about it, someone at Interpro handed me a copy of Ultra-mon.

Calling Ultra-mon "Son of DEBUG" would not be missing the mark. Like DEBUG, it can execute when an error or breakpoint is encountered and also when a set boundary is overstepped. Like DEBUG, it shows the content of each Z-80 register pair; the next 16 bytes at the relative address in ASCII and Hex; displays a full page of memory; executes single steps or calls; and allows the user to modify memory or registers.

Unlike DEBUG, it shows a disassembly of the next instruction to be executed, disassembles a block of memory, or does a dynamic trace at the rate of eight steps per second. All the data from a disassembly or a trace goes to the printer automatically, if one is available.

Ultra-mon relocates itself, relocates a block of memory (changing all internal addresses), or just moves the block.

The execute mode allows a program to run with Ultra-mon in control. Breakpoints can be set in ROM. It can even execute BASIC, to see how the interpreter handles the text.

In my opinion, the biggest problem with DEBUG: It is not a separate piece of software. You can't run it without DOS.

Ultra-mon, on the other hand, comes on tape and runs in standard 16K Level II. What more could you ask? ■

The Datestones of Ryn
Automated Simulations
Mountain View, CA
\$14.95 on cassette
\$19.95 on disk

by Debra Marshall
80 Staff

Creeping stealthily along the passage, magic sword at my side, I rounded a corner and entered a room. A chest was against the far wall: Should I open it? No sign of a trap. I opened the chest: Spiders!! Thousands of them! I slashed blindly, killing some and finally going down under a swarm. As my strength began to fade, something came crashing down on my head. Everything went dim.

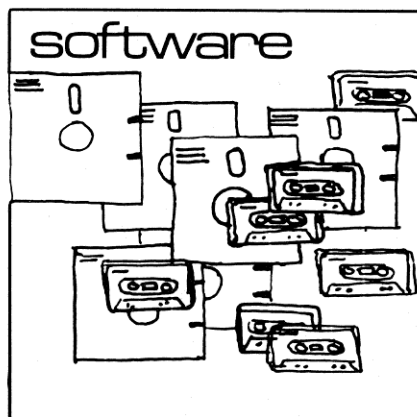
In this bloody manner, I, the nearly invincible Brian Hammerhand, passed out of this life during the 12th of my excursions into the den of the dreaded Rex the Reaver, hidden far from the view of men, deep in the bowels of the Haunted Mountains.

It was an ignominious defeat. I had already despatched Rex himself and his robber lieutenant, as well as other beasties I found lurking in the passages. I had even evaded the dreaded slime, all for naught. The Duchy of Ryn would have to go without its datestones again.

Datestones, the most precious treasure of the Duchy, have been stolen by the brigand Rex and hidden in his mountain lair. You, as the player of Datestones of Ryn, (a.k.a. Brian Hammerhand, mercenary at large), must retrieve and return the stones to the grateful Rynians.

Datestones requires Level II, 16K RAM. I understand there is a version available for Apple and PET as well.

The game comes with a slick looking booklet which introduces the user to the theory behind the game (this is one of a series of more extensive games called Dunjonquest). It explains the player's character variables, equipment, scoring and commands. The scene is set for the



game in a short tale of how Rex got the stones and why the Rynians want them back.

The Adventure Begins

As the game begins, you find yourself in a room at the cave's entrance. You may search for traps, examine the walls for hidden doors, or pass into a corridor and move into new rooms or hallways. At any point you may encounter and be challenged by a beastie: robbers, centipedes, wolves, spiders, skeletal bats and slime. Some of the critters are stationary, others move about and pop up unexpectedly.

The game is timed; you have 20 minutes to roam about the cave, find and recover the datestones, defeat or successfully flee from the cave's many horrors. You may enter and leave the cave as often as you wish in that time period.

Scoring is based on the number of stones recovered and brought outside, the number of foes vanquished, how long you survive, and whether you escape from the cave at the end of the 20 minutes. The experience you gain in each game increases your ability to stay alive in the next.

There were a few things I did not like about the game. The ability and strength chart, which appears while the program is loading, does not remain on the screen long enough for more than a very cursory

scanning; this chart contains potentially important information concerning Hammerhand's strength, intelligence, weaponry, skill, experience, intuition, etc. I did not notice that these qualities changed in degree from game to game, as I understood they would.

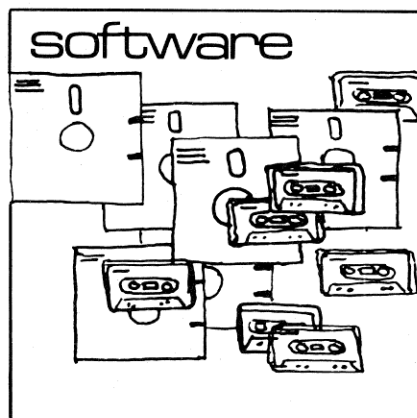
Computer response to fight and flight commands is sometimes too slow to avoid impending disaster. It's very frustrating to watch yourself being engulfed in slime while you keep punching the button that should get you out. Conversely, I have watched beasties die without my lifting a finger to aid in their demise.

What happens during a swordfight is also a bit of a mystery; the messages which appear during these sequences are

obscure enough to make it difficult to determine whether Hammerhand or the beastie is getting the worst of the battle. I have been fighting lustily, fully certain all the while that I was winning, only to discover I was suddenly all but dead. I have also fought long and hard and walked away unscathed.

The game is limited in scope and area, but it is a microquest rather than a full-fledged Donjonquest, and you are fully warned of this distinction by Automated Simulations. It is best viewed as an introduction to their larger fantasy games.

If this game is an indication of the quality of the larger quests published by Automated Simulations, I hope they send me a copy of a long one to review. ■



Pinball
Space Invaders
Acorn Software Products, Inc.
Washington, DC
\$14.95 each

Eliza
Tandy/Radio Shack
Fort Worth, TX
\$14.95

by John Warren

Danger! This program can be dangerous to your mental health. This warning should be emblazoned across Eliza's instruction pamphlet.

Radio Shack's copy of Doctor (as Eliza has come to be known) is relatively faithful to Dr. Weizenbaum's original program, with one disturbing addition. When the user signs off, the program presents a diagnosis that ranges from relatively harmless, "As best as I can determine you have no psychological problems besides a normal amount of paranoia," to this one: "I'm afraid that I must conclude that you are dangerously psychotic and should be locked up."

These predictions seem to be selected randomly. Radio Shack's disavowal (three lines at the bottom of the last page of instructions) is nothing more than a cheap out.

Intelligence Exercise

Aside from this flaw, Eliza is an interesting exercise in primitive artificial intelligence. The program simulates (or as Dr. Weizenbaum prefers, "parodies") a Rogerian, or a non-directive, psychotherapist during an initial interview with a patient.

HOW DO YOU DO? PLEASE STATE YOUR PROBLEM.

i hate my brother.

WHY DOES THAT ANNOY YOU?

i think that i should love the members of my family.

IN WHAT WAY?

i should love them, well, like family.
YOU SAY THAT YOU SHOULD LOVE THEM.

yes, but i do not love them.

DON'T YOU REALLY LOVE THEM?

i do not know that, how can i tell?

PERHAPS YOU DON'T WANT TO TELL?

why did you say that to me?

WHEN HAVE YOU ASKED SUCH QUESTIONS BEFORE?

i am constantly asking questions.

WHY DO YOU BELIEVE IT ISN'T NORMAL TO BE CONSTANTLY ASKING QUESTIONS?

Eliza picks up on keywords and sentence phrases. As the keywords increase, the conversation gets more personal until many feel as if they are communicating with another person instead of with a structured collection of bytes in a computer.

Several scientists, including Dr. Carl Sagan, have predicted that Eliza is the forerunner of an automated form of psychotherapy; however, Dr. Weizenbaum disputes that. In fact he is disturbed at the tendency of people to humanize it.

The program tape's flip side contains an Eliza that routes its output through the Radio Shack Speech Synthesizer and I swear that the synthesizer develops a Viennese accent when Talking Eliza is running.

Eliza is about 10K and makes her home at hex 5000 to 7800 with the entry point at 77F2 right above the Level II reserved RAM and also where a disk-operating system is stationed. Disk operators will have to relocate the program before use. ■

by Dan Keen
and Dave Dischert

All you pinball freaks who have been bitten by the microcomputer bug can now enjoy the best of both worlds!

We went to our local Acorn vendor and came home with a whole stack of their games. The Pinball game stood out among them all. Here's a program that realistically simulates the feeling of being in the finest pinball palace. The action is so real you find yourself rocking the keyboard. It's a good thing the program doesn't say TILT!

The board is drawn and animation begins even before the program finishes loading, similar to Radio Shack's Microchess, where the instructions are loaded directly into the video memory.

The game board has some sequential flashes, even when idle, similar to a real machine beckoning you to play.

Hitting the space bar shoots the ball just like the plunger. The length of time you hold down the bar determines the speed at which the ball enters the playing area.

Ball travel is extremely natural, and even accounts for the slight gravitational effect of the machine being at an angle. In fact, you can even catch the ball by the tip of the flipper to deflect it.

Sound effects are not fancy but are more than adequate. The right hand side of the screen displays your score, bonus points awarded, and the best score of the games played during the session.

This simulation resembles pinball play in every respect except that the ball is square instead of round, but then with the TRS-80 graphic limitations we anticipated that.

NAME THAT SONG

A revolutionary sound program for the 32K TRS-80 disk system co-authored by the musical director of Broadway's "Annie." The game comes with over 100 tunes and you can add your own using the provided utility. This multi-player game has fast action and machine language subroutines. Just like the popular TV show— even has commercials! ONE OF THE MOST ENJOYABLE GAMES I'VE SEEN AND HEARD FOR THE TRS-80"—Richard Taylor, author of TRS-Opera. 32K disk \$19.95

STELLAR ADVENTURE

Explore the galaxy and fight the deadly Kyraxans in this real-time graphic game with sound.

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32K disk \$19.95

CITY ADVENTURE

Travel from a peaceful suburb to the hustle and bustle of the big city. Standing in your way are muggers, runaway cars and numerous other obstacles. A knowledge of the program "Interludes" is helpful. Rated PG. Level II 16K tape \$9.95
32K disk \$14.95

MICRONOPOLY

A full scale version of the famous board game Micro-nopoly is the only program we know of that plays by the rules, allows trading and doesn't require you to have a board. Level II 16K tape \$9.95
32K disk \$14.95



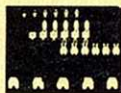
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This option modifies the above units for European Standards.

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Cable converts Model III 50 pin buss to 40 pins used by Model I peripherals.

RS-232 CABLE—\$24.00

Four-foot ribbon cable terminated with 25 pin male DB25 plugs.

SMART-80 and SMART III

By Dick Balcom

Smart Terminal Programs for the TRS-80+ Model I and Model III Computers! This is the ONLY Smart Terminal Program available for the Model III as of this printing! These programs are available in either cassette or disk versions for the Mod I and Mod III. These programs allow you to up AND down text and programs to your TRS-80+ from other users, Timeshare Systems (source, MicroNET), and free public BBS (CONNECTION-80, etc.). This software represents the State Of the Art in terminal software for the TRS-80+.

Smart-80(C), Smart III(C) automatically converts basic programs saved on Tokens to ASCII code, and back again. EDTASM tapes can also be loaded thru the terminal!

Smart-80(D) is the Disk based version of Smart-80 with the ability to transfer diskfiles to another user over both phone and radio with the use of a modem. These programs support Auto Log-on, as well as other features not found in other programs.

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Acorn's PINBALL is one of their latest releases, a company spokesman told us. We find it refreshingly different.

Space Invaders

We've played all of the invader-type games and this one, without question, comes closest to duplicating the arcade game on a TRS-80.

The format stays close to the arcade version, with invader munchkins descending down the screen to attack your bases.

The player determines several variables, including: the number of bases, game speed, the number of shots that you can have on the screen at any one time, the number of bombs fired back at you, and their accuracy.

The program computes these variables to create a weight factor; that is, a number from one to 99 by which your score is multiplied. The high score, if more than

one game is played, is kept and displayed.

Graphics are very good despite the well-known shortcomings of the TRS-80. The sound effects have that familiar ring of Acorn products (remember their "Alien Invasion"?—similar, though these are superior).

The movement of the base station is extremely fast; we feel it's a little too fast. The left and right arrows move it back and forth horizontally. You barely touch an arrow key and the base darts to the opposite side of the screen. With some practice, you can position it fairly accurately.

We like the range of game speeds available. A young child can play well with the slow selection and the fast setting is unnering!

To beat the invaders you must score 655,350, a figure which we haven't been able to attain in several days of play.

Since buying this game we can't tell you how many quarters we've saved! ■

Dancing Demon
16K Level II
Tandy/Radio Shack
Ft. Worth, TX
\$9.95

by Dan Keen & Dave Dischert

Upon entering our local Radio Shack store we saw a crowd of people hovering around the computer. What was the attention-getting program being displayed? Dancing Demon, Radio Shack's latest entry in the world of computer games.

Friends sometimes ask, "What can your computer do?" Telling them it keeps track of the checkbook, helps the kids with their homework (when we let them use it), manages mailing lists, figures loan amortizations, and tracks Amway earnings, just doesn't seem to impress them. Now here's something that will put them in stitches.

This is a good demonstration program for the TRS-80, and shows off some of its animated graphic capabilities.

With Dancing Demon, you enter individual notes to compose a song, then type in dancing instructions and choreograph a tap dancer to the music.

Letters correspond to notes. Each note is followed by a click to simulate the dancer's tap shoes. Extra clicks can be inserted by entering the letter Z when programming the music.

The machine writes the timing, while you select the tempo. Range extends from very fast to extremely slow. Speed selection goes from one to 255.

Once your song has been typed in, you can create a dance routine by entering various letters and numbers which represent different steps and their counts. The dancer can be made to move left or right, jump, stomp left or right, squat, stand, even spin.

Dancing Demon is another brilliant display of string packing. The master of string packing techniques, Leo Christopherson of Android Nim fame, wrote this program too.

The game is in BASIC, and we had no trouble putting it on disk. It runs fine in DOS Plus Disk BASIC also.

Two demonstration programs are included. We enjoy the big production it puts on. The curtain rolls up and the figure dances to the music, taking a bow or two at the end of his performance.

The audio is not high quality sound, but adequate for the needed effects.

Sit back and let your computer entertain you! ■

Invaders Plus
Level IV Products, Inc.
Livonia, MI
\$19.95 cassette
Level II, 16K

by Owen Linzmayer

Anyone who has spent time in or around an arcade hall will recognize the name, Invaders Plus, as coming from one of the most popular video games ever, Space Invaders. I had been eagerly awaiting a good TRS-80 imitation of Space Invaders, and Invaders Plus is a great one.

The game begins by explaining the controls and point ratings. Moving your laser-bases is accomplished through the arrow keys and firing is controlled by the space bar. Rapid machine gun style firing is possible by simply holding the space bar down. The scores range from 50 points for hitting a large invader to 150 points for shooting a bomb down in mid-air. Failure to hit anything with a shot results in a 20 point deduction.

If you hook your aux plug into an audio amplifier before starting the game you will

listen to a fine rendition of the theme song from *Star Wars*. This is amusing the first few times, but since it cannot be bypassed, it soon becomes a nuisance.

There are nine levels of play, which graduate in difficulty from level one to level nine.

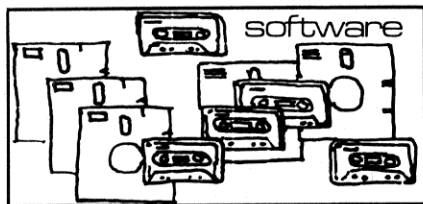
After picking your level of play, the screen fills with the first wave of 49 invaders. Each of these marauding meanies is depicted complete with blinking eyes and animated movements.

The object of the game is to terminate the lives of all the invaders before they send you to an early grave. You can meet your maker in one of two ways: by letting the invaders reach the bottom of the screen, or by letting your laser-base get hit by a lethal rain of bombs.

Should you be successful clearing a wave of invaders, you are treated to a screenful of even deadlier demons. These attackers drop more bombs and move more quickly, making them harder to kill than the preceding group.

Unlike Space Invaders, where the number of screens is only hindered by the player's skill, Invaders Plus offers you only four waves of persistent pests. After killing all four groups, you have the title of Hero bestowed upon you via the computer.

I have purchased other invader programs and have found Invaders Plus to be far superior to any I've seen. This is a truly magnificent programming effort by Larry Ashmun, and well worth the asking price. ■



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80 APPLICATIONS

by Dennis Kitz

"... the Professor folded and smoothed the aluminum foil over the CPU, plugged in the computer, and answered 'PRETTY BIG' to the MEMORY SIZE question."

Many of you who are audio enthusiasts as well as computer buffs will recognize the name of Dr. I. Lirpa, best known for his regular feature contributions to *Audio* magazine. I recently had the pleasure of speaking with Professor Lirpa, and was surprised to discover that he has been experimenting with an imported TRS-80 at his villa in Tóltótt-Kápostá. The good Professor invited me for a visit, and we spent very few enjoyable hours sharing our latest developments for the TRS-80.

This month's Applications will deal with some of the Professor's remarkable hardware and software discoveries. Although I have not had the opportunity to verify all his designs and programming, there is no reason to doubt the competence of Professor Lirpa's work. His successes with a new hybrid breed of swine for soccer ball linings (as well as the early success of the renowned Lirpa-1 power amplifier—see *Audio*, April 1977) are more than enough to recommend him.

Readers may not find it surprising to discover that the tightly controlled socialist government of Transylvania looks askance at information-oriented high technology brought to private citizens from outside its national boundaries. It was with that in mind that Professor Lirpa demonstrated the measures he had taken to keep his TRS-80 a secret.

"Za number von problem of zis mazhine is za problem of juice excretion," he said, referring to RFI as juice, "because za certain Party leaders haff very tiny radio receivers implanted in zer molars. I haff to be very careful."

Photo 1 shows Dr. Lirpa's solution to RFI interference, which, although it is specifically designed to block spurious emissions to European-band receivers, can be modified to American standards by varying the thickness of the aluminum foil used to cover the CPU. The professor explained, "I have used with great success vat I learned on my last visit to America; zis is called za 'delicatessen fold'. It keeps za juice in, like za Faraday cage."

Quietly, almost as an aside, Dr. Lirpa turned to me and whispered, "Faraday spent a good deal of time in prison with

me, you know, which is where I learned his technik." I was struck with the poignancy of the Professor's intellectual plight, but before I could comment he took me quickly toward his piazza workbench where we powered up his TRS-80 for a demonstration.

When his unit began to exhibit typical Model I data instability, the professor reached for a new product exported clandestinely from the West German electronics market. There is a scarcity of reliable integrated circuitry from the West in his country, so marginal ICs must be restored to their original specifications whenever possible. We used an oscilloscope to trace the computer's problem to a balky buffer, and then applied a quick shot from an aerosol can marked "Schmittspritz" (loosely translated as "Schmitt Trigger Spray"—Photo 2). It immediately cleaned up the waveform. The Professor's computer again worked like new.

With the preliminaries finally over, Professor Lirpa led me to his basement laboratory. A few faded photos of Bela Lugosi (autographed "to Prof from Bel") hung on the walls, and a distinct, tangy, and certainly unexpected aroma of southern fried chicken hung in the atmosphere. With a professional air, the Professor folded and smoothed the aluminum foil over the CPU, plugged in the computer, and answered "PRETTY BIG" to the MEMORY SIZE question.

Dr. Lirpa then loaded his own exceptional keyboard bounce program, KKBBBBBBXX, which he has allowed me



Photo 1a.

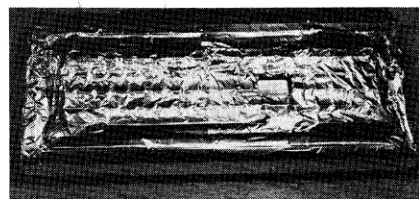


Photo 1b.

to reprint in this column (Listing 1). Since the Professor is a very fast typist, he has eliminated what he considers the unwarranted delays in the original Radio Shack so-called "fix" program, producing a key-



Photo 2.

board routine for the light-fingered. Although originally written for his 29K TRS-80, I have modified it for standard 16K machines. To use it, set memory size to 32640, and load the program as follows:

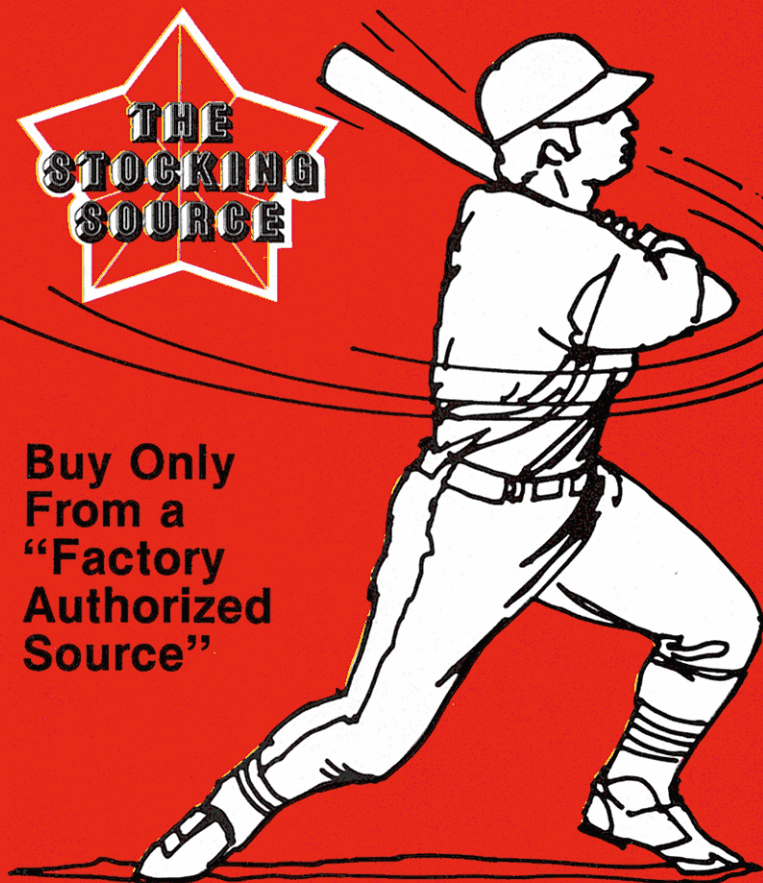
```
SYSTEM      <ENTER>
*? LIRPA    <ENTER>
```

The program will patch itself in place, clear the screen, and start automatically.

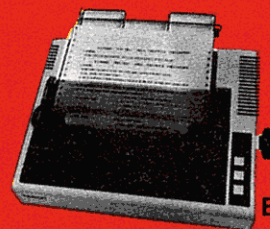
GO WITH A WINNER!



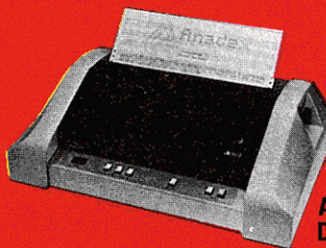
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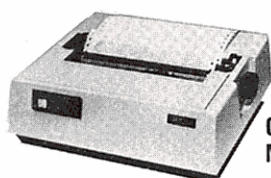


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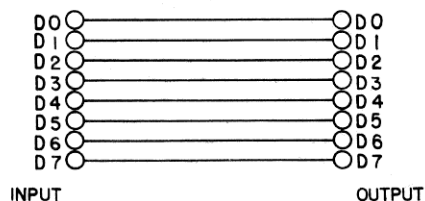
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48





DR. LIRPA'S B/B CONVERTER

Fig. 1

Simple Hardware Projects

Dr. Lirpa's expertise is by no means limited to software; indeed, some of his audio hardware is world famous, and his recent computer accessories are certain to follow that electrifying path to notoriety.

Among the Professor's first computer peripherals was the eight-bit B/B (binary-to-binary) converter. The circuit (Fig. 1) is straightforward enough to be completed and tested in a single evening. Lead dress is not critical, it may be soldered or wire-wrapped, and depending on the application, nearly any size wire may be used. It is self-powered, (as the Professor had the insight to guess correctly the state of energy needs in this part of the Twentieth Century) and virtually foolproof.

The second of Dr. Lirpa's TRS-80 peripherals was a remarkably sophisticated coalescing of work in two distinct fields, and

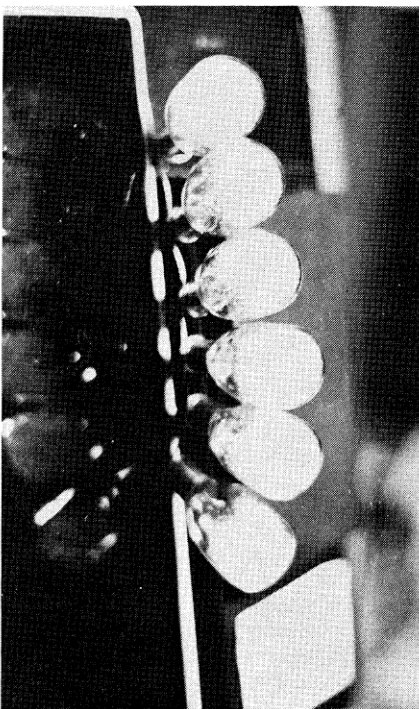


Photo 3a.

```

00100 ; DR. I. LIRPA'S KBBBBBBXX
00110 ; REVISED KEYBOUNCE ROUTINE
00120 ; FOR THE LIGHT-FINGERED
00130 ;
4016      00140      ORG      4016H
4016 807F      00150      DEFW      START
7F80      00160      ORG      7F80H
7F80 213640      00170      START      LD      HL,4036H
7F83 010138      00180      LD      BC,3801H
7F86 1600      00190      LD      D,0
7F88 0A      00200      CHKKEY      LD      A,(BC)
7F89 5F      00210      LD      E,A
7F8A A3      00220      AND      E
7F8B 2018      00230      JR      NZ,CKPREV
7F8D 77      00240      LD      (HL),A
7F8E 14      00250      INC      D
7F8F 2C      00260      INC      L
7F90 CB01      00270      RLC      C
7F92 79      00280      LD      A,C
7F93 D680      00290      SUB      80H
7F95 20F1      00300      JR      NZ,CHKKEY
7F97 0607      00310      LD      B,7
7F99 2D      00320      DECL      L
7F9A 86      00330      ADD      A,(HL)
7F9B 10FC      00340      DJNZ      DECL
7F9D A7      00350      AND      A
7F9E 3E00      00360      LD      A,0
7FA0 C0      00370      RET      NZ
7FA1 321A40      00380      LD      (401AH),A
7FA4 C9      00390      RET
7FA5 A6      00400      CKPREV      AND      (HL)
7FA6 2818      00410      JR      Z,STORE
7FA8 3A9940      00420      LD      A,(4099H)
7FAB A7      00430      AND      A
7FAC 20E0      00440      JR      NZ,INCD
7FAE 3A1A40      00450      LD      A,(401AH)
7FB1 3C      00460      INC      A
7FB2 321A40      00470      LD      (401AH),A
7FB5 FEFF      00480      CP      0FFH
7FB7 2802      00490      JR      Z,DECA
7FB9 18D3      00500      JR      INCD
7FBB 3D      00510      DECA      DEC      A
7FBC 321A40      00520      LD      (401AH),A
7FBF 7B      00530      LD      A,E
7FC0 73      00540      STORE      LD      (HL),E
7FC1 0A      00550      LD      A,(BC)
7FC2 A3      00560      AND      E
7FC3 C8      00570      RET      Z
7FC4 C3FB03      00580      JP      03FBH
06CC      00590      END      06CCH
00000 TOTAL ERRORS
    
```

Program Listing 1.

was the immediate result of a period of study at Harvard University's Department of Psychology and Social Relations under

the tutelage of a famous behavioral psychologist. Called the Electronic Flash Error Flag (Photo 3a), this peripheral is used

for data entry training; it has two potential results, depending upon the skills of the trainee.



Photo 3b.

The first result of the EFEF is illustrated in Photo 3b, taken as a typical trainee enters complex scientific data into Dr. Lirpa's TRS-80. Photo 4 is the operator's view of the computer the moment an error is made. Finally, Photos 5 and 6 demonstrate one of the few unavoidable (but fortunately temporary) side-effects of this peripheral device.

The second potential result of the EFEF is shown in Photo 7. Particularly inept but determined data entry students have this view of the TRS-80 after a few weeks of training.

At this writing, neither the National Institute of Health nor the Food and Drug Administration has approved the EFEF for commercial sale in the United States, but the Professor has arranged with *80 Microcomputing* to make a complete set of plans available. Note that this is a five-volt device, making it entirely compatible with the TRS-80's internal circuitry. (See the end of this column for ordering information.)

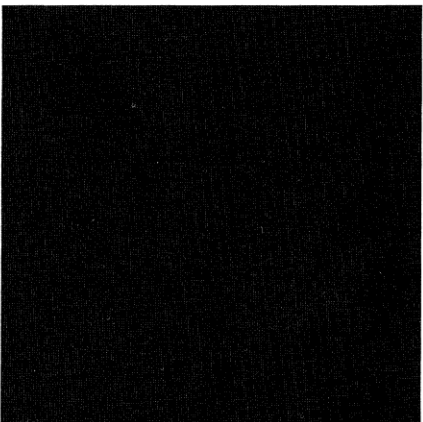


Photo 4.

Homage to Colonel Sanders

Biological experiments have rarely been a part of the TRS-80 experimenter's repertoire, but Dr. Lirpa has begun to make advances in this field. He presented me with a paper entitled, "Recent Progress in the Development of High-Speed, Full-ASCII, Biodegradable Interfaces for Eight-Bit Microprocessors Running At or Near 1.7 MHz".

The depth of thought amongst personal computer pioneers can be astounding, and Dr. Lirpa's paper left me speechless. The fried chicken aroma I had noted earlier began to make sense as I paged through his report.

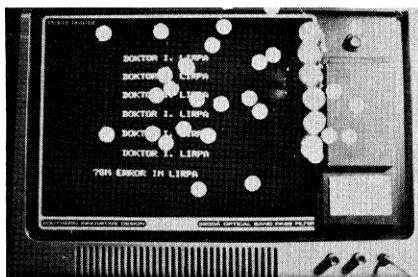


Photo 5.

With pride, the Professor unlocked a special refrigeration unit. Inside was revealed a line of biological interfaces complete enough to stock a delicatessen: the five-volt salami (see Photo 8), read-only head cheese, chicken in ASCII, random-access mutton, corned beef modems, disk-based pork chops, bank-select spare ribs, and direct-connect meatballs.



Photo 6.

Needless to say, I had the distinct feeling that I was in the presence of a dedicated but eccentric scientist. Obviously, Dr. Lirpa sensed my feelings, for he drew me aside. "You see," he explained, "our computers are sophisticated but clumsy devices. Biological devices, on the other

hand, are multi-layered in their responses. Look here." He drew out a frog's leg as I slapped at flies. "Observe as I connect this leg onto this cable."

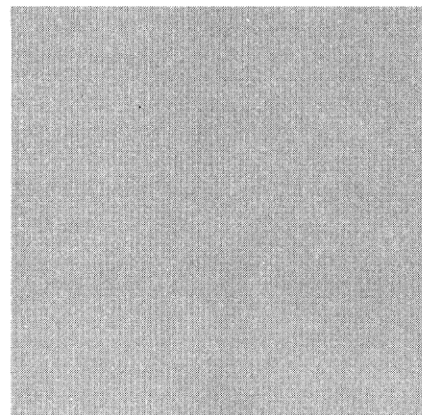


Photo 7.

The good professor entered a quick program, and the TRS-80 screen glowed in its coarse graphics with Renaissance musculature designs like those of Leonardo da Vinci. Then, amazingly, the frog's leg began to write the first line of a restaurant menu: "H-U-S L-E-V-E-S".

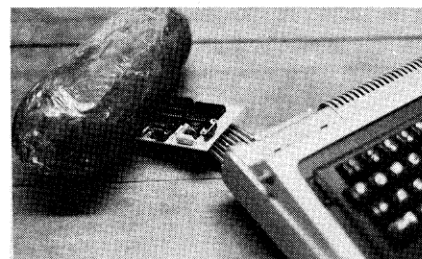


Photo 8.

Dr. Lirpa turned slowly, smiling and eyeing me with an indecipherable gleam. "Tell zem. In American zey will know zat ze computer is of two dimensions, but ze body and brain is of three. Maybe four. Tell zem."

With that, Dr. Lirpa took my arm and directed me back to the piazza, where we parted company. As I flew back to America, I discovered myself inadvertently fondling the plastic pack of transistors and chicken feathers that Dr. Lirpa had proffered to me in the final moments of our visit.

Think about it, dear readers. The biodegradable interface. Servos. ■

80 ACCOUNTANT

by Michael Tannenbaum C.P.A.

"... the future is always based on the past. If the past has been a disaster, a disaster will be projected."

As an advocate of microcomputer business systems I am frequently accused by my colleagues of being a "solution looking for a problem." I usually respond that my solution has an application in any size business. Naturally, my associates have not been surprised that I can usually find some way of proposing the use of a microcomputer in most firms that I have visited.

No doubt this is because most firms require functions such as planning, recording financial activity, and the analysis of operating results. With the exception of accounting recordkeeping, these functions are best accomplished at the highest management level. Even though the planning and analysis procedures are done informally, it's always good to document the business plan.

An excellent example of such a management planning tool is Oracle 80, a program for the Model I which is available from Instant Software, Inc., Peterborough, NH. Oracle 80 is a business analysis and forecasting program. Using "time series" statistical methods it can store and analyze up to ten years of monthly data, 30 years of quarterly data or 60 years of annual data.

Time series analysis methods examine a body of data to define the relationships between units of data. This procedure unearths questions which must be answered if a good plan is to be developed. For example, if the January sales are ten percent higher than December, is that a seasonal variation, inflation or the result of a super effort by the sales department?

When using Oracle 80, any data base can be entered. The program provides an easy to use data entry and edit method. This data can later be stored on disk. The program is menu driven and self-prompting; as a result, it is quite easy to use.

The data can be displayed on the screen, graphed or printed. The graph and print routines are set up in an interesting way. Once the data has been displayed, a flashing square appears on the screen. This announces that a graph and printing routine called "Scribe" has been activated. Pressing "G" creates a graph of the data. Pressing "P" prints a copy.

From the data entered, Oracle 80 will compute moving averages and rate of change information. If three years of data is present, you can calculate seasonal indices, a deseasonalized series and cycle factors. From this data, forecasts of future activity can be derived; hence the name Oracle. If desired the forecasting method can be applied to the data base to develop a table of predicted versus actual values.

You can influence these projections by entering cycle factors. These factors should be used if it is suspected that future activity might differ significantly from past performance. Generally, Oracle 80 assumes the future will resemble the past.

This is, of course, the main difficulty when using statistical techniques for forecasting... the future is always based on the past. If the past has been a disaster, a disaster will be projected. Because of this fact, the methods employed in Oracle 80 should be used with *extreme* care.

Improved General Ledger

One of the most important functions of the general ledger is to serve as a history of accounting transactions during a fiscal year.

As a record of past activity, it is most valuable if your figures can be subdivided into months rather than merely a year-to-date total. Abnormal relationships could indicate mispostings or other accounting irregularities.

Unfortunately, most microcomputer general ledger programs don't segregate monthly totals. A year-to-date and the current period is displayed, but nothing else. If you request a report of account status, the information displayed will not be informative.

There is however, a general ledger package that displays and retains a separate total for each month during a fiscal year. This package, the TCS general ledger, was originally only available on the CP/M operating system. It has been converted to TRSDOS and is now available for a two drive Model II from the Micro Architect, Inc., Arlington, MA.

In this system, current activity and the previous year's month-end totals are re-

tained. The system also maintains a current and a prior year-to-date total. When a month has been completed, the system shifts each month down one position and adds the month to be dropped to the prior year's year-to-date total. The current month's total is placed into the vacant position and the current year-to-date total is updated.

When an income statement is requested, the system prints comparative data for the month for the current and prior year. No other system previously reviewed does this.

Although Osborne general ledger has provisions for a quarterly and prior year total, it does not maintain monthly totals and, therefore, cannot print as much detail as the TCS system. The Radio Shack ledger contains only the current month and year-to-date totals.

The TCS financial reports have other features that are unusual for a microcomputer general ledger system. In the TCS system you can group accounts for printing, even though the underlying account structure remains quite detailed.

It is normal practice to set up a separate general ledger account for each bank to facilitate reconciliation procedures. With some systems all the detail is displayed when a balance sheet is printed out. With the TCS system you can set up a master account for cash and designate the detail accounts as subsidiary accounts. All the detail will be retained but only the master total will appear on the financial report.

The report printing program also skips over the account code number when printing the income statement and balance sheets. Thus the financial reports have only the account amounts which add greatly to the appearance of the reports.

The account structure can prepare departmental reports. These reports can be prepared after the main income statement is printed. If there is more than one department, the account activity for all the departments is printed in summary on the income statement and by cost center on the departmental statement.

These provisions create management reports that are both readable and super-

lor to either the Osborne or Radio Shack general ledger packages. However, TCS offers yet another feature that appears to be unique. This system allows you to enter and display an annual budget on the income statement.

If it sounds like I really liked the system, you are right. The real acid test, however, was a client demonstration. Despite some of the packages weak points, such as its data input modules, the superior management reports sold the TCS system.

In the data input modules, the TCS system shows its age. This system was written for the Altair computer and first released in 1978. At that time, data input and output used either a separate "dumb" serial CRT or a slow speed printer. If a CRT was used, cursor control was usually limited. The best a programmer could expect was a clear screen feature.

With today's intelligent devices, full cursor manipulation is possible. This feature is characteristic of the Radio Shack accounting programs and makes data entry and edit very convenient. Unfortunately, since the designers of the TCS system

could not even be sure of the I/O devices to be used, they designed the system for the lowest common denominator: a teletype. As a result, data input and editing is cumbersome compared to the Radio Shack system.

Another shortfall is its inability to perform an interactive edit of account numbers as data is entered. The account numbers are not compared against the master file until a data entry batch summary report is printed out. Thus it is quite possible to enter an invalid account number and not be advised of the error until a report is completed.

The system still traps an incorrect account number and the files cannot be updated with an improper account. The only inconvenience is that the error is not reported instantly to the operator. This is not necessarily a deficiency. Many data processing professionals believe interactive edits are undesirable.

With an interactive data entry procedure, the operator must look at the screen after each item is entered to verify it. This causes a marked increase in data entry

time. Studies indicate that the highest data entry rate is achieved with a blind data entry method.

MARIS Files

All of the TCS software systems use a MARIS (Multi ARray Indexed Sequential) file system. In this system, keys to the file are stored in an array in memory. When a request is made to examine or update the file, the array is referenced and the data file required is located on the disk. Although this system works quite well, it effectively limits the number of accounts which can be accommodated in the general ledger to 400.

Since this file method also limits the number of customer and vendor accounts, evaluate your application *before* you install the system. It is also important to note that a data compression algorithm is used to reduce the size of the data files. As a result of this data compression, when you store amounts greater than \$20 million, a problem results when you retrieve the number from the file.

Before concluding the review of the sys-

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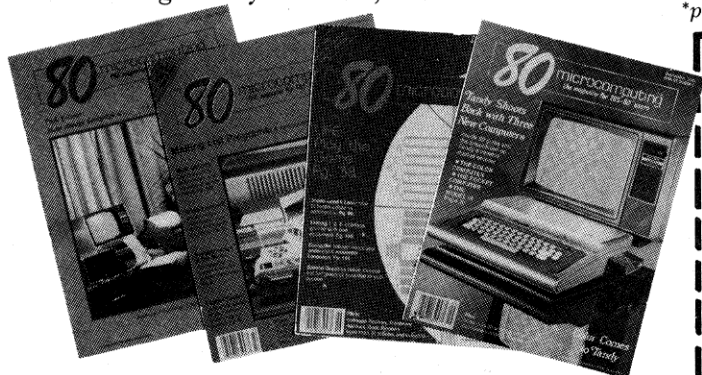
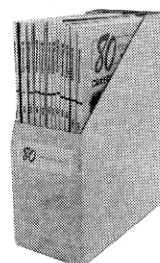
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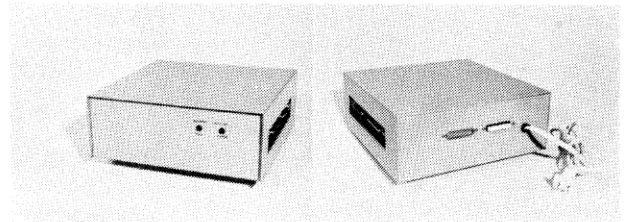
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Model PB1B, 1 pair parallel I/O and 1 pair RS-232 ports

The Print Buffer is a communications processor containing a microprocessor, ROM, 16K or 32K RAM, and parallel and/or serial I/O ports. The host computer(s) and printer(s) are constantly monitored. Data is rapidly accepted from the host(s), stored in an appropriate FIFO stack, and outputted from the appropriate stack when a printer requests a new line. In buffers with more than one input port, storage is dynamically allocated between users such that the faster user gets more storage. A special command code allows users to program the buffer. In program mode, data (object code) is received and stored in RAM, but the data is not outputted to a printer. Control is passed to the object code now residing in RAM. Suggested uses include code conversions, e.g. conversion of ASCII to IBM correspondence code to drive Selectrics, or the equivalent of PRINT programs of a word processor that prepares edited files for printing.

STANDARD MODELS*

| Computer | Ports |
|----------|---|
| TANDY | Parallel ports Edge connectors gold plated |
| APPLE | Centronics standard connectors |
| PET | IEEE 488 |
| RS-232 | RS-232, 110-9600baud |

*16K memory with one pair of ports

STANDARD OPTIONS available upon request

1. 32K Memory
 2. A second pair of I/O ports; parallel, IEEE-488, RS-232. May be different from first set.
 3. Automatic AC power control for printer.
 4. 220 volt, 50-60 Hz. operation.
- Other configurations available upon request.

Having used the Print Buffer in my day to day operations, I am impressed with the time it saves my operators. The program that we use for general ledger posting first prints the ledger information and then posts the information by storing it on disk. Using the Print Buffer, the information is quickly transferred from the CPU to the Buffer. Before the printer stops printing the posting is usually completed. That means my girls don't waste a lot of time waiting on the line printer and then again on the posting. Both operations are usually done simultaneously. The Buffer handles the printer, my girls handle inputting information — and now they don't waste time in the process.

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tem, I would like to comment on the customer support offered by the Micro Architect. During the volume test of the system, I discovered a bug the day before a major client demonstration. The bug resulted from the differences between the Microsoft BASIC interpreter on CP/M and on the Model II under TRSDOS.

I called the Micro Architect at 11:00 AM and had the fix at 8:00 PM. That's service!

In addition, the Micro Architect offers his customers a newsletter, free for the first year. The newsletter advises customers of bugs and details programming changes. The General Ledger system is priced at \$129 and comes with a 100+ page reference manual, installation guide, 15 programs and sample data files on an eight-inch disk. It requires a 132-column printer and a dual disk system.

Visicalc for the Model II

By now, most Model II owners have been advised of the Model II version of Visicalc. I have only just received a preliminary copy without documentation. At first glance it appears to be identical to the Model I version with the exception of the worksheet display which uses the reverse print features of the Model II to outline the edges.

If you are not familiar with its features I recommend that you visit your neighborhood computer center and see a demonstration. To whet your appetite, let me describe some of its outstanding features.

Imagine a worksheet 64 columns wide and 256 lines deep. Although such a worksheet, if it could be fabricated, would be impossibly cumbersome to manipulate, the electronic worksheet is easy to use. When data is entered or examined the Model II serves as a magic window. Through clever programming, the cursor control keys allow any portion of the worksheet to be displayed, changed or printed. Once you complete your data entry or examination, the large worksheet can be stored on disk, chopped up or modified in any way that the user deems necessary.

Imagine making a change in one number and having every number on the whole worksheet dependent on that number automatically adjust itself. This includes column totals, row totals, and dependent numbers such as percentages. Sounds exciting? It's only the start.

Using a special replicate command, values can automatically be generated with a single keystroke. A good example of this is the development of expense spreads used in budgeting. When budgeting, it is frequently necessary to schedule the

same number in each of 12 months. With the replicate command, only the first month's value need be entered. Visicalc will spread it over the remaining 11 months automatically.

Replication is not limited to values. Formulas can also be replicated. If a relationship can be established between columns or rows, the same relationship can be duplicated horizontally or vertically. As a practical matter, with the use of this function it is possible to create a 12-month budget with the entry of only one-month's data.

Further, the program provides a means for fixing the horizontal and vertical col-

umn headings. These are continually displayed regardless of where you are on the worksheet.

The program is supplied with a multi-lesson tutorial. A detailed explanation of each command and the syntax to be followed concludes each tutorial. In addition, a useful pocket reference card is supplied, which briefly outlines program commands.

Though I am still learning how to use Visicalc, the payback has already been self-evident. I just completed a detailed system design in two days using this program. It should have taken me two weeks. ■

EDUCATION 80

by Earl R. Savage

Most of you are probably too young to remember when "programmed instruction" first hit the educational scene. It made quite a splash and then faded away.

In those days, programmed instruction meant printed material consisting of sequential frames of instruction, questions, and answers. Sequences were linear and/or branching. Students moved from frame to frame at their individual paces.

Does that description sound familiar? Of course there are differences, but in broad perspective it is quite similar to Computer Assisted Instruction (CAI). If we knew why programmed instruction failed to achieve a place in education, we might avoid a similar fate for CAI.

Programmed Potential

My personal opinion is that programmed instruction (PI) had significant potential—a view shared by many educators.

A number of factors contributed to the demise of PI, but I believe that three major mistakes were made.

Many proponents of PI let their enthusiasm get ahead of them. They over-sold others on the merits and potential of this new instructional technique. PI was touted as *the answer* to all learning problems.

When PI was proven not to be the one final answer, reactions turned quite negative.

The second major mistake was also committed by overly zealous proponents who presented PI as a method to be used exclusively. Other instructional tech-

niques were not needed to supplement PI—no lecture, no discussion, no anything else.

This was directly contrary to the well-established principle that no instructional method is suitable for all students or at all times. PI proved to be no exception to the rule and fell into further disrepute with more educators.

Perhaps the most serious mistake was in not refuting the idea that PI would replace teachers. It is unfortunate that some proponents agreed with this position and few denied it emphatically.

An ancient axiom in education is that nothing will be successful if it is opposed by teachers. Teacher reaction was quick and sure to PI, a teaching method designed to "do them out of jobs": PI bit the dust.

We certainly don't want CAI to suffer the same fate as did PI!

Significant Differences

The similarities between these two instructional methods are striking. There are, of course, several fundamental and significant differences.

CAI programming is interactive with the student. The student cannot simply sit passively; he must do something. The student's progress is controlled. The programmer, through his program, determines when the next frame is to be presented, the number of times answers can be wrong, and the branch (if any) to which the student should move.

These and other differences greatly increase the potential of CAI over PI. How-

ever, the basic similarity is so evident that there is a real danger of repeating old mistakes.

Proponents must not even imply that CAI is the answer to all learning problems of all students. We must not suggest that CAI can do the job alone. Especially, we must refute any notion that CAI can or will replace teachers.

The idea that CAI can replace a teacher is obviously false. Nothing mechanical can replace a competent teacher. Recognizing that, we must prevent opponents from raising this particular red herring. CAI is just another instructional tool that can be extremely effective in the hands of a competent teacher.

One further point: in spite of all that has been said, CAI has one great weakness that PI did not have. The material form of PI was that of the familiar printed page. CAI, on the other hand, requires the use of an unfamiliar machine—a piece of “technology.”

Those of us who are technically oriented frequently lose sight of the fear many folk have for every new mechanical thing, especially if it is electronic. Teachers are like the general population in this regard. Many of them are suspicious of computers.

We would do well to introduce our new instructional technology gently to non-technically oriented teachers. Pushing too hard or too quickly will only solidify their opposition.

The ultimate role of microcomputers in education is in the hands of you and me and other folk like us. If we are not careful, we'll throw the game without knowing how it happened. What a loss that would be for the future improvement of education.

Swiss Cheese

Hanson House (55 Hanson Place, Stratford, CT 06497) has several very useful utility programs. There is one especially for all of us who LIST programs for anything more than our own files. When listings are made for student use, they should be neat and well formatted.

It's hard enough for a student to study a program when it is laid out in decent form; don't make him study in a maze. And when you send one of your programs to a publisher, you want to give him as few reasons as possible to reject it. A congested listing can cause problems to everyone not already familiar with the program.

Hanson's Swiss Cheese is a listing formatter. It produces a clear and pleasing LIST. Of course, Swiss Cheese doesn't improve your program—just its appearance!

The procedure for using Swiss Cheese is quite simple. With the program to be LISTED in your 80, you must key in a couple of PEEKs and POKes which are given in the instructions. You then CLOAD Swiss Cheese and answer several questions. Swiss Cheese and your printer do the rest.

You may be wondering why this handy program is called Swiss Cheese. The name is quite appropriate but I'm not going to tell you why. You'll find out when you run it the first time!

New Text

If you are teaching or planning a programming course, there is a new textbook which you should consider. It is the second (1981) edition of *Computer Programming in the BASIC Language* by Neal Golden (Harcourt, Brace, Jovanich, NY).

This textbook begins with program design by means of flow charting and trac-

ing. It progresses from simple commands to the complex. The text includes plenty of programs and program fragments to illustrate and explain each point discussed. One of its strongest points is that each chapter contains a large number of exercises, projects and programs for assignment to students.

Do not expect the BASIC to match exactly the BASIC in your 80. There are minor differences, most of which are pointed out and should cause no confusion. My most serious criticism concerns the printing of the letter O and the zero. The author has reversed the normal convention and used the crossed O for the letter instead of for the zero. This is a minor annoyance.

Golden's textbook is very well done. I urge you to examine it before making a final decision on a text for your course. If you are using another text, this one will be a good resource book for you. It can be very helpful, also, for the student who is “going it alone.” ■

THE ASSEMBLY LINE

by William Barden, Jr.

Ever wanted to convert a slow-speed sort of string arrays into assembly language? Ever done it? I'll bet that not too many of you have.

There's a couple of good reasons for this. First of all, the structure of string arrays is not too well defined in any documentation. Sure, there are some nebulous references in the Level II manual about the format of string arrays, but there's not enough to go on. Secondly, it seems like it might be an imposing task.

I'll give you a definitive description of one-dimensional string arrays (the most commonly used kind) and show you that, yes, it is an imposing task! Actually, strike that last comment—in spite of my wife's divorce action, I had fun doing it...

Variable List

BASIC program execution creates a list of variables, as shown in Fig. 1. There are two sections to this list: simple variables and array variables. Location 40F9H in working storage defines the location of the start of the simple variables, while location 40FBH contains the location of the start of the array variables.

Variables in the first part of the list are simple and string variables. These are non-array variables. In the case of simple variables—integer, single-precision, and

double-precision numeric variables—each variable is held in its entirety in the list. Associated with each variable is a code of 2, 4, or 8, a two-letter name in reverse order, and the value of the variable. Note that the code corresponds to the length (number of bytes) in the variable, as shown in Fig. 2.

The variables are arranged on a first-come, first-entered basis; they are not in alphabetic order. String variables have a code of 3, a two-letter name, and a block of three bytes. The first byte of the block is the length of the string, while the remaining two bytes are the address of the string, as shown in Fig. 3.

The location of the string is in one of two areas, either the BASIC program itself, or in the string working storage area in high RAM, just below the area reserved for system programs with the MEMORY SIZE? parameter.

If the BASIC statement defining the string is something like

```
100 A$="PETERBOROUGH? AH YES...I SPENT A WEEK THERE ONE DAY..."
```

then the address in the string location points to the actual location of the string in the BASIC statement.

If processing of a string is involved,

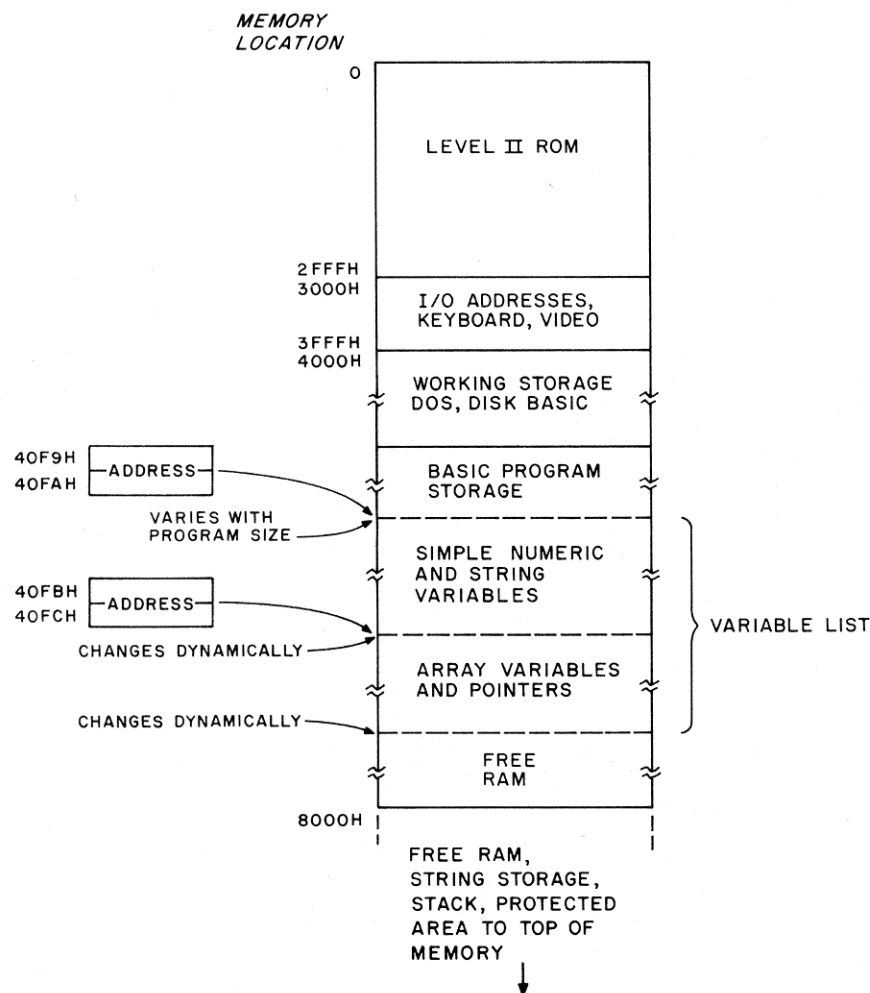


Fig. 1.

then the address in the string location points to a string working storage location. The strings build down in the working storage area.

```
100 AS="FORT WORTH?"+"AH YES...TWO WEEKS..."
```

Now for the second part of the list. The second portion of the list contains definitions of arrays. These are entered as the arrays are encountered, either by DIM statements, or by references to an array such as

```
100 AZ$(0)="2ND PRIZE IS •TWO WEEKS• IN MISSION VIEJO!"
```

The numeric and string arrays are defined as shown in Fig. 4. A type code (3 for strings, 2, 4, 8 for numeric) is followed by a two-character name, an offset to the next array variable definition, the number of di-

mensions, and the maximum value of each dimension. For numeric arrays, the elements of the array follow. For string arrays, three-byte blocks defining the length and location of the elements of the string array follow.

We'll confine our discussion to string arrays of one dimension since these are the most common strings we have to deal with. A typical string array in the second part of the variable list appears in Fig. 5.

There are several interesting things to note about the string array. First of all, unused elements of the array have 0 length and 0 address pointers. Secondly, the string array definition moves! As new simple variables are defined, the entire array section of the variable list slides downward to make room for the new variable.

In order to write an assembly language program to sort a string array, then, we've got to handle these null entries. We also must pin down the location of the array

definition just before any machine language call.

VARPTR with String Arrays

You've probably used VARPTR to get the location of strings for embedded machine language. VARPTR can also be used for finding the location of the string array parameter block. Using

```
100 A = VARPTR(AZ$(0))
```

for example, will set A equal to the location of parameter block AZ\$(0) in the second part of the variable list. Since this is the first element of the string array and the remaining elements follow in consecutive order, this is a good start in designing an assembly language sort.

Here's the rub, however: If you use VARPTR followed by another dummy variable in a USR call, the VARPTR address will no longer be valid. Using

```
100 A = VARPTR(AZ$(0))
110 B = USR0(A)
```

will compute the location of AZ\$(0) all right, but the next statement introduces a new (possibly) variable B, which is added to the first part of the variable list and moves the array definitions down! Make certain to use any VARPTR call immediately before a USR call without introducing new variables, as in

```
100 B = USR0(VARPTR(AZ$(0)))
```

We now know enough to really get in trouble. There's absolutely no reason in the world why we can't now design and implement an assembly language sort that will take any given one-dimensional string array of any size and sort the elements in a few minutes to replace hours of BASIC sorting.

Bubble Sort

Use a bubble sort to change the three bytes in each array element. The bubble sort is one of the slowest sorts, but it does have the advantage of using the same buffer, which is important for large arrays. Also, since this is machine language, it should be very fast compared to BASIC.

The machine language code would be called from a BASIC program with VARPTR pointing to the first element of a one-dimensional string array. The address of this element would be passed in HL by the USR call. The SABUBL (String Array Bubble Sort) would then do its thing and return with the parameter blocks in the array definition arranged in order of the

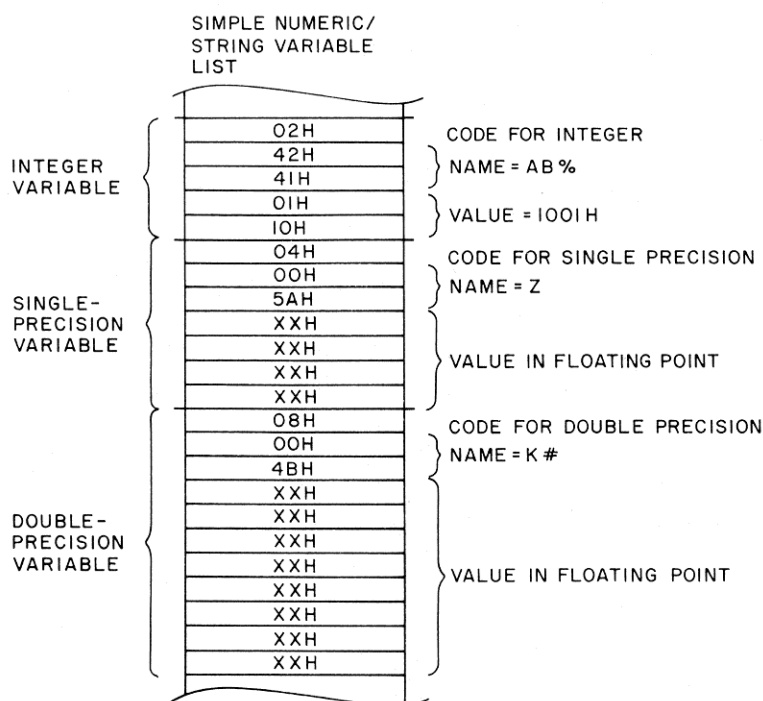


Fig. 2.

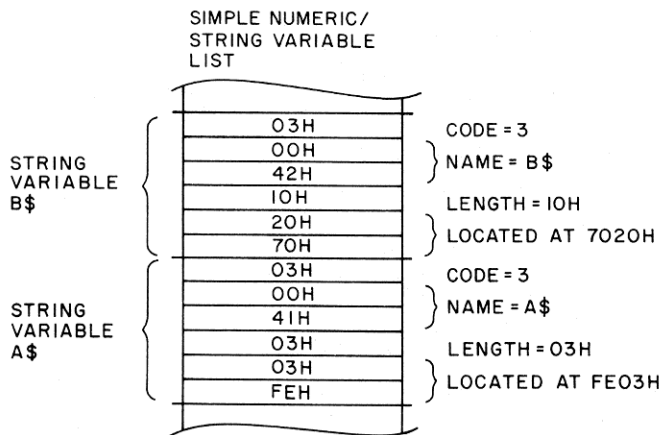


Fig. 3.

strings they represent. An example is shown in Fig. 6. Null entries would be moved up to the start of the array definition.

A bubble sort works by scanning the array from beginning to end. During each scan, the current entry is compared to the next entry in order. If the current entry is smaller or equal in weight to the next entry, the scan moves to the next entry. If the current entry is larger in weight to the next entry, the two entries are swapped—the next entry moves up, while the current en-

try moves down. In effect, the lighter entries bubble to the top, lighter entries being those that start with ASCII characters that are closer to the beginning of the alphabet or that have a lesser ASCII code.

Each pair of entries is compared. When the last pair of the array (the next to last and last) is compared, another pass is made through the array. A variable number of passes is done until no two elements have been swapped, indicating that the array is in order. The minimum number of passes is one. The maximum

number of passes is n , the number of elements in the string array. This worst case occurs when the array has an order of something like Z, Y, X, W . . . A.

The Program

The final program is shown in Program Listing 1. It is arbitrarily located at location 7F00H. You may reassemble it at any location and call it by conventional Level II or Disk BASIC USR calls.

Since this is a big chunk of code to pick up and follow, I'll give you some guidelines. A is used as a working register. B generally holds a DJNZ count. C generally holds the comparison of the entry lengths. DE and HL are used to hold the address of the current entry and the next entry in the array, respectively. IX points to the current entry in the array definition. IX is incremented by three after each comparison. IY holds a flag that is initially 0, but is set to 40H if a swap occurs. When IY is still 0 at the end of a pass, the array is sorted. The stack holds the number of entries left to be compared on top, with the initial value (VARPTR value) in the next position.

SABUBL is entered from a USR call. A call is first made to 0A7FH to put the VARPTR value in HL. This is then transferred to IX by a PUSH HL, POP IX.

The code from SAB010 through line 840 is the outermost loop of the sort. This path is followed for each pass through the array until the flag value IY is 0, indicating that no change (swap) has occurred. We should explain one tricky portion of the test of IY. IY is set to 40H when a swap occurs. When IY is PUSHed and a POP AF is done, the contents of IY goes into AF. The one bit in 40H goes into the Z flag. If a swap has occurred, therefore, the Z flag is set, and the JR NZ, SAB090 falls through to the JR SAB010.

Each time a new pass is initiated, the number of elements in the array is picked up from (IX-2) and (IX-1) and put into BC. This is decremented by one count, as the last comparison is to the last entry-1 and the last entry in the array. IY is set to 0 at the beginning of the pass.

The next outermost loop (note the indented comments) is from SAB020 through line 790. The code here processes the complete array from beginning to end. First, the number of pairs to process in BC is pushed onto the stack.

Next, the length of the current entry is put into A. If this entry is zero (null) the string is a null string and no swap has to be made as the entry is already in the higher position. A JR is made to SAB070 in this case. The code at SAB070 POPs the number of entries from the stack, increments IX by three to point to the next

THE ASSEMBLY LINE

entry, and then decrements the count in BC. If the count is not 0, the end of the array has not been reached and SAB020 is executed again to compare the next pair.

If the length of the current entry is not 0, the length of the current string is put into B and the length of the next string into A (lines 310, 320). A SUB and NEG is then done with the result going into C. If the result is negative, the length of the current entry is less than the next. If the result is positive, the length of the current entry is greater than the next, and the length of the next is put into B. At SAB030, the smaller string length is in B. The smaller string length is used so that comparison of the strings beyond the end is not done.

The "sense" of string lengths is used in the case of both strings containing the same data, but one being longer than the other. In this case the shorter string is moved to the top of the array. An example of this is the set of strings ABC and ABCAA; ABC is placed before ABCAAA in the sort.

The code at SAB030 gets the addresses of the current string and the next and puts them into HL and DE. These two addresses are saved in the stack, as HL and DE are incremented in the comparisons.

The length of the next entry is tested for zero. If the next entry is a null string, then no comparison will be (or could be) made and a JR to SAB060 is made to swap the entries after the stack is reset.

The code from SAB040 through line 560 is the innermost loop of SABUBL. It compares the string defined by the current entry to the string defined by the next entry. The string addresses are in HL and DE, respectively. The comparison is handled this way: starting from the left byte, a comparison is made of each of the two strings. If any byte does not compare, the strings are unequal, and a JR to SAB050 is made. B contains the number of bytes in the smallest string. If it can be decremented down to zero, the characters compared are equal and the code at line 570 is executed. The LD at line 570 picks up the sense of the two strings. The longer string will follow the shorter string in this case.

At SAB050, A contains the sense of the comparison or the lengths. The starting addresses of the two entries are restored in DE and HL from the stack. If the strings are equal, A contains a zero, and a JR to SAB070 goes on to the next comparison with no swap.

If the current string is less than the next string (minus), no swap is required, and a JP is made to SAB070. If the comparison fell through, but the strings are of unequal length, A will be minus if the current

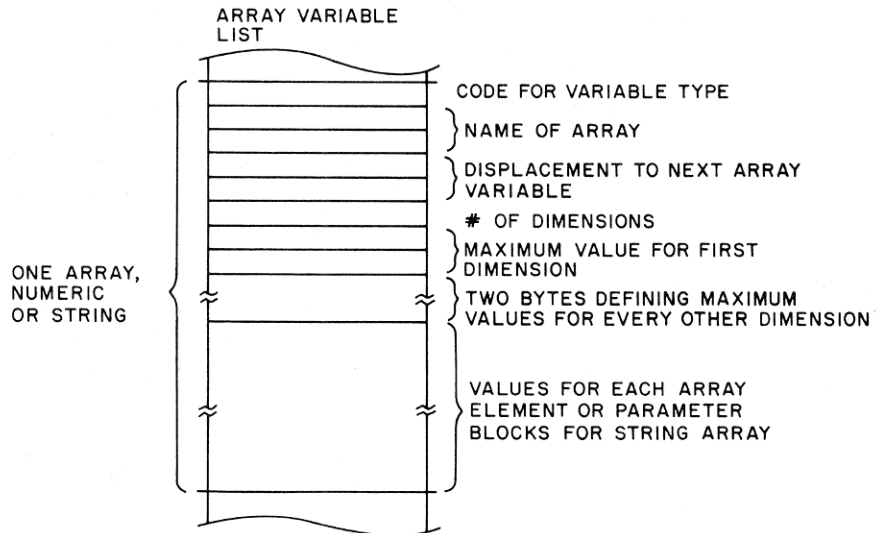


Fig. 4.

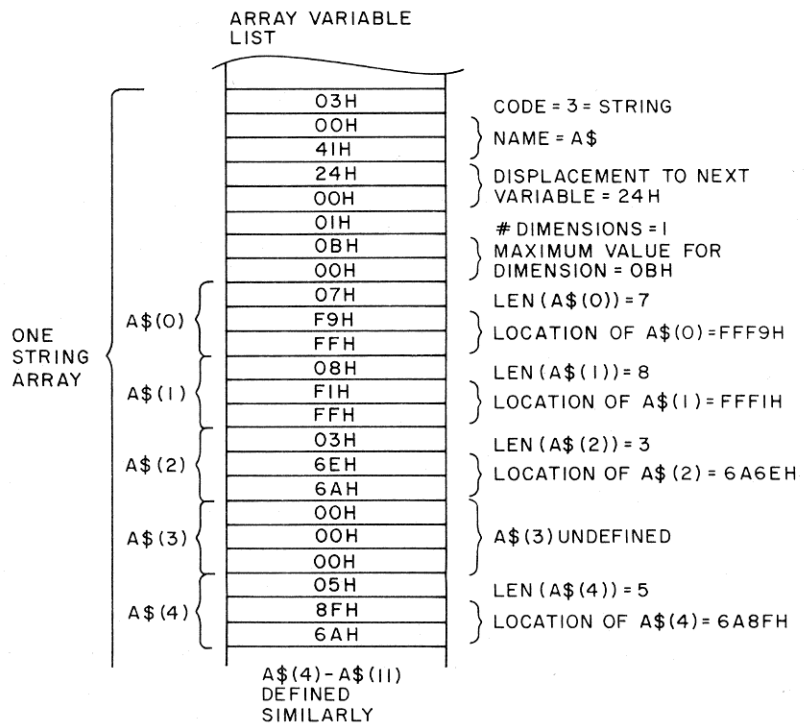


Fig. 5.

string is of shorter length than the next, and SAB070 will be entered. If the current string is greater than the next, or if the current string is longer than the next but contains the same data, the three bytes in the variable table entries are swapped to re-order the strings, and bubble up the lighter string to the top of the array.

If a swap occurs, IY is set to 40H, indicating that a change occurred.

SAB070 continues the comparisons.

Testing the Bubbles

Now for the easy part (heh, heh)—testing the code. Program Listing 2 shows the BASIC program we used in the test. Sub-

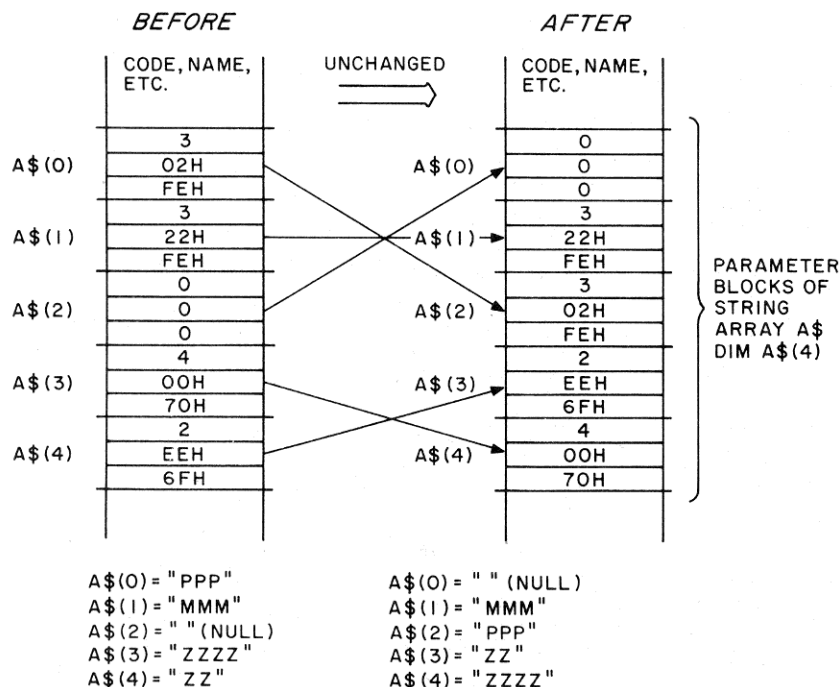


Fig. 6.

Program Listing 1.

```

7F00      00100      ORG      7F00H
00110      ;*****
00120      ;* STRING ARRAY BUBBLE SORTER. SORTS A ONE-DIMENSIONAL *
00130      ;* STRING ARRAY OF ANY LENGTH *
00140      ;* ENTRY: HL=PTR TO ELEMENT 0 OF STRING ARRAY *
00150      ;* OBTAINED FROM VARPTR(A$(0)) *
00160      ;* EXIT: STRING ARRAY SORTED *
00170      ;*****
00180      ;
7F00 CD7F0A 00190 SABUBL CALL 0A7FH ;GET POINTER
7F03 E5      00200      PUSH HL ;TRANSFER TO IX
7F04 DDE1 00210      POP IX
7F06 DDE5 00220 SAB010 PUSH IX
7F08 DD4EFE 00230      LD C,(IX-2) ;GET # OF ELEMENTS
7F0B DD46FF 00240      LD B,(IX-1) ;MIGHT BE BIG SOMGUN
7F0E 0B      00250      DEC BC ;MINUS ONE FOR PAIR COMP
7F0F DD210000 00260      LD IX,0 ;ZERO CHANGE FLAG
7F13 C5      00270 SAB020 PUSH BC ;SAVE # ELEMENTS-1
7F14 DD7E00 00280      LD A,(IX) ;GET LENGTH OF S1$
7F17 B7      00290      OR A ;TEST FOR ZERO
7F18 2857 00300      JR Z,SAB070 ;IF NULL DO NOTHING
7F1A DD7E03 00310      LD A,(IX+3) ;GET LEN(S2$)
7F1D DD4600 00320      LD B,(IX) ;GET LEN(S1$)
7F20 90      00330      SUB B ;GET SENSE
7F21 ED44 00340      NEG B
7F23 4F      00350      LD C,A ;SAVE
7F24 FA2A7F 00360      JP M,SAB030 ;GO IF LEN(S1$)<LEN(S2$)
7F27 DD4603 00370      LD B,(IX+3) ;USE SMALLER LENGTH
7F2A DD6E01 00380 SAB030 LD L,(IX+1) ;GET ADD S1$
7F2D DD6602 00390      LD H,(IX+2)
7F30 DD5E04 00400      LD E,(IX+4) ;GET ADD S2$
7F33 DD5605 00410      LD D,(IX+5)
7F36 E5      00420      PUSH HL ;SAVE
7F37 D5      00430      PUSH DE
7F38 DD7E03 00440      LD A,(IX+3) ;GET LEN(S2$)
7F3B B7      00450      OR A ;TEST FOR ZERO
7F3C 2004 00460      JR NZ,SAB040 ;GO IF NOT NULL
7F3E D1      00470      POP DE ;RESTORE ADDRESSES
7F3F E1      00480      POP HL
7F40 1813 00490      JR SAB060 ;GO TO SWAP
7F42 1A      00500 SAB040 LD A,(DE) ;GET S2$ BYTE
7F43 96      00510      SUB (HL) ;S2$-S1$
7F44 ED44 00520      NEG A ;S1$-S2$
7F46 2005 00530      JR NZ,SAB050 ;GO IF NOT EQUAL
7F48 13      00540      INC DE ;BUMP S1$ POINTER

```

program continues

routine 1000 through 1050 generates a string of random characters in the range A-Z. Each string is from two to five characters long. Typical strings generated might be AS, VRF, XXGTT, and so forth. The generated string is equated to A\$.

The main body of the code first clears string space of 5000 bytes; reduce this if required. Next the screen is cleared and an array called AZ\$ is allocated. At this point, all of the entries in AZ\$ will be null.

Now, each of the 500 entries in AZ\$ is filled with a random string generated by the 1000 subroutine. At the same time (actually a little later) the entry number and string are displayed on the screen.

After the AZ\$ array has been filled with random strings, a DEFUSR0 defines the machine language subroutine at 7F00H. The USR0 call calls the subroutine to sort the string. After the sort, a RETURN is made to print all of the entries in AZ\$, which will now be in sorted order.

The sort itself takes a little over a minute. I tried a BASIC version of this, but turned it off after several passes (yawn).

To use SABUBL, reassemble it as required for your system. Load SABUBL before loading BASIC, and then protect the SABUBL area. Call SABUBL using the standard Level II or Disk BASIC calling sequence. Use VARPTR to point to the first element of your one-dimensional string array.

Rotate Into ROM?

Sorry about the first paragraph in the February column on interrupts. I couldn't make sense out of it either. Here's an updated list of material erroneously deleted in previous articles:

;-CAUTION—DO NOT USE DISK BASIC WITH THIS
LDIR ;MOVE TO POUGHKEEPSIE
;...DELETE THIS CODE IF REQUIRED...

Insert as required.

This infallibility business is difficult... in the same column I stated that interrupt acknowledge is not available on the TRS-80 bus. Of course, it is, as INTAK-. Jonathan Titus of the excellent Blacksburg Press *TRS-80 Interfacing* books caught me on this and also pointed out that some CPU hardware mods are possible to utilize interrupt modes 0 and 2.

Now, the results of the Mini-Contest in the February issue. First, the answer: In debugging I had forgotten that it's rather difficult to shift ROM memory with an RLD instruction!

There was an overwhelming response to this question. I selected five at random from the first three days as I now realize that readers should not be penalized by

THE ASSEMBLY LINE

```

7F49 23      00550      INC      HL      ;BUMP S2$ POINTER
7F4A 10F6    00560      DJNZ     SAB040 ;GO IF NOT DONE
7F4C 79      00570      LD        A,C    ;GET SENSE
7F4D D1      00580      POP       DE     ;RESTORE S2$ ADDR
7F4E E1      00590      POP       HL     ;RESTORE S1$ ADDR
7F4F B7      00600      OR        A      ;TEST A
7F50 281F    00610      JR        Z,SAB070 ;GO IF STRINGS EQUAL
7F52 FA717F  00620      JP        M,SAB070 ;GO IF S1$<S2$
7F55 DD7504  00630      LD        (IX+4),L ;SWAP ADDRESSES
7F58 DD7405  00640      LD        (IX+5),H
7F5B DD7301  00650      LD        (IX+1),E
7F5E DD7202  00660      LD        (IX+2),D
7F61 DD7E00  00670      LD        A,(IX)
7F64 DD4603  00680      LD        B,(IX+3) ;SWAP LENGTHS
7F67 DD7703  00690      LD        (IX+3),A
7F6A DD7000  00700      LD        (IX),B
7F6D FD214000 00710      LD        IY,40H
7F71 C1      00720      POP       BC     ;SET CHANGE FLAG
7F72 DD23    00730      INC       IX     ;RESTORE # ELEMENTS
7F74 DD23    00740      INC       IX     ;BUMP PNTR TO NEXT EL
7F76 DD23    00750      INC       IX
7F78 0B      00760      DEC       BC     ;DECREMENT # OF ENTRIES
7F79 78      00770      LD        A,B    ;GET COUNT
7F7A B1      00780      OR        C      ;TEST FOR ZERO
7F7B 2096    00790      JR        NZ,SAB020 ;GO IF MORE ENTRIES
7F7D FDE5    00800      PUSH     IY     ;TEST CHANGE
7F7F F1      00810      POP       AF
7F80 DDE1    00820      POP       IX
7F82 2002    00830      JR        NZ,SAB090 ;GO IF NONE THIS TIME
7F84 1880    00840      JR        SAB010 ;BACK FOR ANOTHER PASS
7F86 C9      00850      RET        ;BACK TO BASICS
0000      00860      END
00000 TOTAL ERRORS

SAB010 7F06      SAB020 7F13      SAB030 7F2A      SAB040 7F42      SAB050 7F4D
SAB060 7F55      SAB070 7F71      SAB080 7F72      SAB090 7F86      SABUBL 7F00

```

```

100 CLEAR 5000
105 CLS
110 DIM AZ$(499)
120 FOR I=0 TO 499
130 GOSUB 1000
140 AZ$(I)=AS
145 PRINT @ 540,I;AS;" ";
150 NEXT I
160 DEFUSR0=&H7F00
170 B=USR0 (VARPTR(AZ$(0)))
180 FOR I=0 TO 499
190 PRINT AZ$(I),
200 NEXT I
210 END
1000 AS=""
1005 C=RND(4)
1010 FOR J=0 TO C
1020 B=RND(90):IF B<65 GOTO 1020
1030 AS=AS+CHR$(B)
1040 NEXT J
1050 RETURN

```

Cole, Cary, NC; Paul Ketrick, Arleta, CA; and Calvin Dodge, Lakewood, CO.

I'm planning a puzzle session for a later column; many of you seem to be interested.

Thanks also for comments regarding column content—they've been very informative. If you have comments, please send them to William Barden, Jr., Department Z-80 Hacker, 28182 Palmada, Mission Viejo, CA 92692. ■

slow mail delivery. The reader who sent the telegram is, however, included in the five! Winners receiving a copy of my

Howard W. Sams Z-80 Microcomputer Design Projects are: Tom Pappas, Scottsdale, AZ; SNAPP Inc., Cincinnati, OH; Lee



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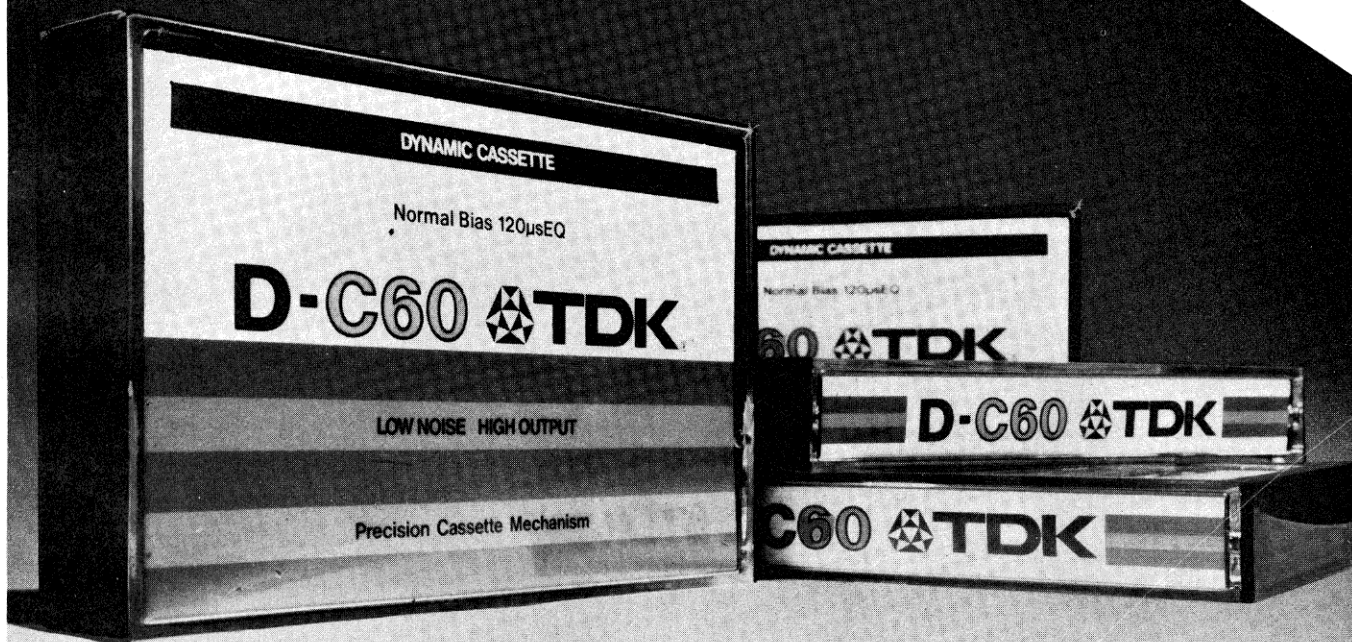
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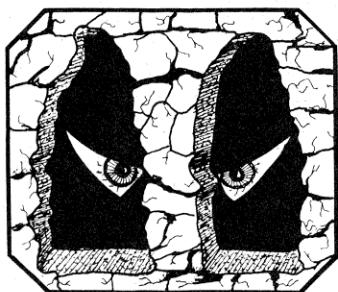
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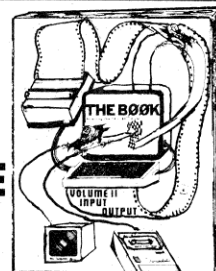
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By Kim Watt from Breeze Computing
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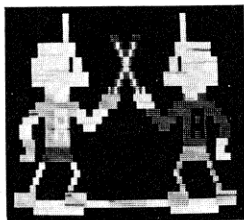
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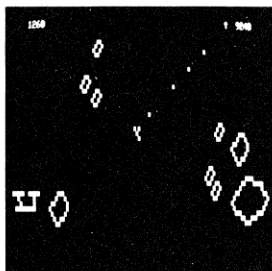


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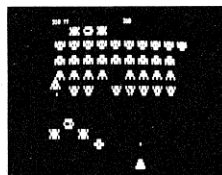
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By Hogue & Konyu from Big-Five
"The rage of the arcades" is now available for TRS-80! Exciting sound effects add to the action as the invaders swoop down to destroy your base. Even while you have your hands full battling the aliens, you have to watch out for the Flagship! Super graphics, super action, super fun!

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Get your flipper fingers ready for action in this real-time, machine language game.

Lots of sound and flashing graphics make this fast action game so much like the real thing that you'll have to remind yourself not to shake your TRS-80. Choose from five playing speeds to match your skill. Can you beat your friends' scores? Will you avoid the dreaded "Bermuda Square?" Get PINBALL today and find out.

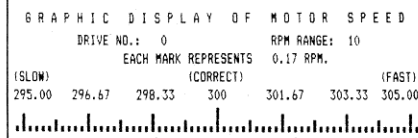
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"He says that the FCC is not interested in putting anyone out of business; solutions . . . will . . . be hammered out by the bureaucracy."

A Backyard Tinkerer and Tenured Bureaucrat on the RFI Circuit

Milt Mobley is a healthy mix of irascible southern gentleman, backyard tinkerer and tenured bureaucrat. He's retired now but he's still working hard. This month he is on the seminar circuit. He travels from Hilton to Ramada to Holiday Inn telling computer equipment manufacturers all they want to know about radio frequency interference and how to measure it in their products. Milt knows alot about radio frequency interference (RFI).

Milt enjoys being able to speak freely. "This time, I think the commission may have bitten off more than it can chew, or more than it can swalla, anyhow." Milt is responding to a question from someone in his seminar audience. The questioner, an engineer from Digital Equipment Corporation, is wondering how the hell his company can continue to sell its systems in view of the new Federal Communications Commission's (FCC) limitations on conducted and radiated RF emissions. It seems that while each component (card

reader, CPU, terminal, mass storage unit, printer, etc.) individually meets RFI limitations, the system fails when put together in certain electrical or physical configurations. The engineer is worried.

Life is Getting Tough

Life got tough for the engineer from DEC when the FCC decided to set some limits on the amount of radio frequency interference that his computer could legally generate. Three classes of computers exist and interference limits are based on the setting in which the machine is likely to be operating. The classes are commercial, Class A; residential, Class B; and if the computing device uses modulated RF for video, Class I. (See the tables of regulations included with this article.)

Milt counsels him to stay calm. He says that the FCC is not interested in putting anyone out of business; solutions for these problems will somehow be hammered out by the bureaucracy.

Milt should know. He has over 30 years of civil service behind him. He is the retired Assistant Chief Engineer of the FCC, and in his time he has seen alot of RFI problems come and go in the commission's central lab in Laurel, MD.

Exo Facto

When he worked at the FCC an informal understanding among staff members prevented them from discussing the ins and outs of day-to-day business with members of the industries that they regulated. It is the same today. The understanding is known as *exo facto* and its point is the prevention of conflicts of interest between commission members (some of whom are industry veterans) and their cronies in business. While in principle a good idea, a negative aspect of *exo facto* is that it makes it very hard to get any information at all out of the commission—information like how to conduct and pass RFI tests.

Since his retirement, Milt can speak freely about these matters—and does. His services have been retained by R&B Enterprises of Plymouth Meeting, PA. R&B is one of several firms in the relatively new field of electromagnetic compatibility testing (EMC). It operates a test facility that specializes in the performance of esoteric tests for government and military radiation specifications.

FCC Testing

As the overhead projector whirs away late in the afternoon in the stuffy function room, transparency after transparency slides across the screen. Milt is attempting to show 100 computer engineers and technicians just what is expected of them when they submit their test data to the commission for certification. Both the power line conducted emission measurement and the radiated emission measurement that these people must make neces-

(Continues to page 63)

Technical Standard for Radiated Emissions

| Device | Frequency (MHz) | Distance (meters) | Field Strength (uV/m) |
|-------------|-----------------|-------------------|-----------------------|
| Class A: | 30-88 | 30 | 30 |
| | 88-216 | 30 | 50 |
| | 216-1000 | 30 | 70 |
| Class B: | 30-88 | 3 | 100 |
| | 88-216 | 3 | 150 |
| | 216-1000 | 3 | 200 |
| Class I TV: | 30-47.7 | | 15 |
| | 47.7-1000 | | 15 |

Regulations of Power-line Conducted RFI Emissions

| | Frequency (MHz) | Maximum RF Line Voltage (uV) |
|---------------------|-----------------|------------------------------|
| Class A Devices: | | 1000* |
| | | 3000* |
| Class B Devices: | 0.45-30 | 250* |
| Class I TV Devices: | 0.45-25 | 100# |

Is the Z-80 Shouldering Zilog's Burdens?

That tiny plastic inlay in all that dental bridgework under your keyboard, the Z-80 chip, has drawn much speculative press attention.

80 Microcomputing contacted Zilog, Inc. of Cupertino, CA makers of the Z-80 microprocessor, to assess the impact on the microcomputer industry of reported financial reversals.

The Z-80, which is the central processor for the TRS-80 Model I, II and III, as well as Heath/Zenith's micro, the Personal Micro Computer, Sinclair Electronics' ZX-80 and other microcomputers, has generated an estimated \$50 million in unit sales for Zilog. According to a study by Dataquest, a San Francisco area research firm, growth is expected to continue at the rate of 20 to 30 percent over the next two years.

However, reports in the trade papers indicate that Zilog has suffered reversals in the marketplace and that it has scrapped its MCZ-2 multiprocessor project. Company spokesmen label the press coverage misleading half truths.

Bill Carrico, director of marketing for Zilog components, could not comment directly on reports by *Computer Systems News* that Zilog had lost a \$1.5 million contract with ITT for MCZ-1 distribuon and its \$1 million contract with Ontario Hydro for a Canadian Z-Net. He did say that "when IBM loses a contract, it never makes the papers."

Carrico explained that Zilog is divided into two distinct divisions: component manufacture and systems manufacture. Both the MCZ-1 and Z-Net are systems projects.

These system projects, said Carrico, are aimed at the electronic office systems of the future. These are microprocessors used in dedicated environments and do not effect chip manufacture for the microcomputer market.

Components Market Strong

Twice in the last year and a half, threatened shortages of microcomputer chips have caused the marketplace some consternation. But, according to Carrico, Zilog's component manufacture, including a new "Ethernet chip that will allow you to access the Xerox net," couldn't be stronger.

In addition to the Z-80 eight-bit microprocessor, Zilog's Z-8000 16-bit microprocessor has found wide acceptance. A new entry for Zilog, the Z-80B is an improved six-MHz version of the Z-80.

Further, a Z-8 chip will offer Tiny BASIC,

2K of ROM and 128 bytes of RAM. This, Carrico explained, "is a single-chip environment for hand-held games, sewing machines" and other dedicated uses.

"We are generally selling and shipping more (Z-80s) than ever," said Carrico. He rebutted the idea of a chip shortage attached to Zilog reversals by saying that the Z-80 is also licensed by Mostek, SGS in Italy and Sharp Electronics of Japan.

According to Carrico, Nippon Electric Corp. (NEC) of Japan is also making their chip, "but they're not licensed. They did a straight copy."

The market continues to show steady growth for the Z-80 eight-bit microprocessor and Carrico is confident that growth rate is secure. He argues that the Z-80 has found a "price-performance niche" that solidifies its future.

"He rebutted the idea of a chip shortage... saying that the Z-80 is licensed by Mostek, SGS and Sharp..."

Though it's true that the 16-bit microprocessor offers more computing power and speed, it is also more costly. This extra power is unnecessary for some users, said Carrico. "A Cadillac is still more expensive than a Ford," Carrico said, and "you don't put a V-8 in your lawnmower."

Carrico compared the price of computing to the price of calculators. While it's true, he argued, that "the price of a four-function calculator has fallen to \$10... a scientific calculator with 20 or 30 functions... will never be \$10." Both price points will be constant for years.

The additional capability of the 16-bit processor is not an easy transition. "There is a schism that has taken place... when you go from a Z-80 to a Z-8000. They are not binary of source compatible. When you go to the 16-bit machines you will go into another strata (of computing)." This transition, said Carrico, brings with it, "a major software challenge."

Though conversion software may be the answer, the key to the original success of Zilog and the Z-80 was the chip's compatibility. According to 80 Microcomputing's Technical Consultant, Jake Commander, the Z-80 was a compatible super-

set of the 8080 chip by Intel Corp.

Zilog, too, has recognized this. Their response is Z-80B, an eight-bit chip that offers 50 percent more computing speed than the Z-80. "The Z-80B" said Carrico, "will offer... six as opposed to four megahertz."

Network Microcomputers

Despite the health of Zilog's component market, Zilog's systems reversals cannot go unnoticed in a company that is dedicated to what is called a Z-Net. Z-Net is cable-connected network of microcomputers, all time-sharing with larger units. Locally, Zilog is using such a net to connect its Cupertino office mail. There is no doubt, said Carrico, that "distributed computing is the name of the game."

That commitment is precisely the source for speculative rumors that emerged recently in the trade press. Over a year ago in March, Exxon Enterprise, Inc., NY, Zilog's parent company, purchased Summit, Zilog's own research and development arm. Exxon merged that company with several other research organizations and their Vydec word processing machine, the Qyx electronic typewriter and the Qwip facsimile transmission unit into Exxon Office Systems, Co. This reportedly gave Exxon the third largest office distribution network, after IBM and Xerox, in the industry.

Summit's link to a national network was viewed by some trade press members as having an adverse effect on Zilog's own Z-Net plans.

Carrico, however, reported that "Summit was a project internal to Zilog that was spun off" well before Exxon picked it up. "It had nothing to do with Zilog for two years" before that time.

Component support of such networks continues and is manifest in Zilog's "Ethernet chip." Though he admitted to oversimplifying an eventual Ethernet peripheral, Carrico said that such a general purpose device will become available and it will be compatible with the national Xerox system and Z-80 based machines.

"Software is the more complex issue," said Carrico, who did not volunteer a market date for such a peripheral.

Zilog's own experiments have been with interoffice file sharing, but Carrico did not discount the use of Zilog developed equipment for the "remote user," that is the owner of a home microcomputer. ■

by Michael Comendul
80 Staff

Tracing Roots: Who Is Making Which Micro Products?

When Alex Hailey set out to find his "roots," back in the dense jungles of Africa, he understood that it would be a difficult task. Today it seems no less easy to trace just where a microcomputer product truly originates.

It has long been rumored that the TRS-80 Pocket Computer is really a product of Sharp Electronics of Japan, and that Centronics Data Computer Corp. of Hudson, NH makes some Radio Shack printers.

In the software industry, too, many products bear a copyright notice on their labels hinting at their true beginnings.

People at Tandy feel that it should be of no concern to consumers just where a product originates. So long as the Radio Shack label is on it, it is a Radio Shack product, says Ed Juge, director of computer merchandising.

Becoming the Rule

Radio Shack is not the only company that markets the products of another company under its own label. The practice is fast becoming the rule rather than the exception in the microcomputer industry. Competing firms worldwide are entering agreements through which one manufacturer allows another to market its products.

In some cases, the original manufacturer is recognized on the package. In few cases is the manufacturer acknowledged in the advertising.

What are the benefits to such agreements between manufacturers?

Consider the business management and planning program Visicalc, written for Personal Software by Software Arts of Cambridge, MA. According to Jeff Walden at Personal Software, Sunnyvale, CA, the program was very successful from the start. When Radio Shack agreed to market the program for the TRS-80, Visicalc was then available in 8,000 additional stores worldwide, a distribution that Personal could not hope to obtain on its own.

It is to Tandy's advantage to market the program, as well. According to Walden, "It took the equivalent of 10 man-years to produce Visicalc—a sizable investment and risk." Radio Shack, unwilling to invest the time or money to produce a business package of equal scope, found it more reasonable to add Visicalc to their own product line.

Bill Schroeder of Galactic Software in Mequon, WI suggests another benefit. He points out that a company like Tandy specializes in hardware; they need software to support their computers. Schroeder feels they contract with another company to produce software in order to boost their own computer sales. Or, as in the case of Visicalc, they buy a program that is already on the market and sell it.

Often in the hardware industry, a company will "farm out" projects that it is not prepared to handle on its own. For example, Centronics Data Corp. makes two of the Radio Shack line printers (Line Printers II and IV), and Sharp Electronics makes the TRS-80 Pocket Computer, according to the Radio Shack's Ed Juge.

"People at Tandy feel that it should be of no concern to customers just where a product originates."

Standards and Support

"Radio Shack's 26 (as of 1980) plants build about 42 percent of the products we sell," stated Juge. "Our products, however, must adhere to the same standards whether the vendor is an outside company, or one of our facilities."

The question of product support depends upon the agreement. When Instant Software in Peterborough, NH markets a Galactic Software program, according to P. T. Wolfe, director of marketing, Galactic supports the product.

Contracts and Agreements

The agreements between companies vary and hinge upon who owns the patent or copyright to a product, according to Schroeder. If a company approaches Galactic Software and requests that a program be written to specifications, the company that requests to have the program written usually obtains the copyright. In that case, the marketer need not recognize the original manufacturer on the packaging.

If, on the other hand, a company labels

software that is already copyrighted, then the original publisher's name usually appears on the packaging in a copyright notice.

Unless specified by contract, a firm that markets another's products is not obligated to recognize the original publisher in advertising. Sometimes, however, the reputation of the original manufacturer or publisher lends prestige to advertisements. Radio Shack touts Standard and Poor's on Stockpack, for example. Juge comments, "It was designed by an acknowledged leader in the industry, and they want the exposure, too."

A few difficulties do arise from labeling practices. In one case, a consumer was unpleasantly surprised to find that he bought the same program from both Tandy and Personal Software under two different titles. (See "80 News," Jan. 81.)

In the process of labeling the Personal Software game Time Trek, Tandy requested to have the title of the program changed to Space Warp. According to Ed Juge, the request was made to avoid copyright conflicts with the producers of Star Trek. Tandy's Bill Walters termed the incident "unfortunate," and added that "what has happened here will not happen again."

In another case, Taranto and Assoc., San Rafael, CA, filed a lawsuit against Advanced Computer Products, Inc. of Santa Ana, CA, for advertising Taranto and Assoc., Inc. TRS-80 Model I and Model III software products without any authorization or rights to do so, according to a Taranto press release. Taranto obtained a preliminary injunction ordering Advanced Computer Products "not to sell or offer for sale computer products infringing Taranto and Assoc. copyrights, nor to use, display, or advertise" their trademarks or trade names.

Whether a case of survival or cooperation, most attribute the labeling practices to the rapid growth of the computer industry. Companies are under tremendous pressure to maintain their product lines. If a firm fails to produce a new product or an updated version quickly enough, they jeopardize their standing in the industry.

Bill Schroeder states simply, "If a company has limited resources and they want to stay ahead, they need the help of another company." ■

by Chris Crocker
80 Staff

Educational Testing on the Model II

The Educational Testing Service (ETS) of Princeton, NJ has reached an agreement with Radio Shack to offer a career guidance program for college level students using Shack's Model II microcomputer.

ETS, best known for the creation and administration of the widely used, and lately controversial, Scholastic Aptitude Tests (SATs), is the leader in the field of educational testing and measurement. They have now developed a microcomputer-based career guidance program to help students make the right choices at graduation time.

ETS' System of Interactive Guidance Information (SIGI) is a large database program comprised of six modules which are designed to help the student clarify career values, identify career alternatives and understand the implications of a specific career choice. Originally developed by ETS for use with a PDP-11 minicomputer in the 1960s, SIGI has undergone many revisions and updates.

"The Model II version represents the first application of SIGI to a microcomputer."

This self-prompting program is designed to lead the student through the various stages of career decisions. First, the student's values are identified. Then, careers that can satisfy these values are located in the SIGI database. Several career choices are examined, predictions of success are made based on the student's interests and abilities; planning for the career is then discussed. Finally, a strategy for attaining the career is outlined.

The First SIGI Microcomputer

The Model II version represents the first application of SIGI to a microcomputer. SIGI program director PHd. Martin Katz told *80 Micro* that the Model II was chosen "only after an exhaustive survey of the microcomputer industry." He added that ETS's choice of the Model II was predicated upon many factors, some of which were Radio Shack's comprehensive network of retail and service outlets, the relatively low price of the system (\$5,000), the large storage capacity of the Model II

(64K RAM), the quality of the video display and the availability of the computer and all peripherals such as printer and disk drives from the same vendor.

SIGI's conversion from mainframe to micro was accomplished by Ehrlich Assoc. of San Francisco, CA. The efficient use of code was the major software design criteria and Ehrlich's conversion employs elaborate packing and data compression techniques in order to squeeze the SIGI database into the Model II. A CP/M operating system is used and the package requires the presence of an external eight-inch disk drive in addition to the Model II's on-board drive.

To acquire the use of the SIGI package a college or university must apply for a license from ETS. When the license is granted, the institution receives the two-disk SIGI database and operating system, and full program documentation. Each additional SIGI disk pack costs \$600. Annual updates of the database are also available.

Expanding the Market

At present, 800 colleges and universities around the country are using SIGI on mainframes and minicomputers. ETS hopes that their affiliation with Radio Shack, and the availability of SIGI on a microcomputer, will increase that number substantially. While reluctant to deal in hard figures for first year projections, ETS's Martin Katz did indicate that the availability of SIGI on the Model II could result in a five-fold increase in the number of SIGI licenses granted in the next two years.

To insure success of the venture various sales incentives are being offered to institutions who consider acquiring the SIGI/Model II package. The most significant of these is a 15 percent price reduction on hardware given to any SIGI licensee by Radio Shack.

Though not sought by Radio Shack, its affiliation with the Educational Testing Service is likely to be beneficial. The prestige ETS enjoys within the educational community can only help the Shack's own image in this market.

Charles Phillips, senior vice-president in charge of educational marketing for Radio Shack, told *80 Micro*, "We are flattered to be chosen by ETS for the SIGI project. I think it speaks well of our hardware and we are looking forward to a mutually beneficial relationship."

by Chris Brown
80 Staff

CAI Information Exchange

Looking for a source for information exchange concerning computer based instructional systems?

The Association for the Development of Computer Based Instructional Systems (ADCBS) may be your answer. It is an international nonprofit organization with members in the United States, Canada and Europe. Its membership consists of diversified groups such as banks, medical colleges, insurance companies, school districts, teachers and college professors.

ADCBS began in 1964 as ADIS, the Association for the Development of Instructional Systems. It was started by a small group of IBM 1500 system users who were looking for a forum to informally exchange courseware and information. From these humble beginnings, it has developed into an association with 950 members and publishes a bi-monthly newsletter, a quarterly journal, and hosts an annual conference which is open to the public.

ADCBS members are users of all kinds of systems, from mainframes to micros. Most micro users are members of elementary school systems.

Interested persons should contact the ADCBS national office at this address: ADCBS, c/o The Computer Center, Western Washington University, Bellingham, WA 98225. ■

Tandy to the Rescue

In February *80 Micro* reported on the North Carolina School of Science and Math, a public school which is doing some interesting things with micros in its curriculum. As you remember, the school is using several Apples, and has one TRS-80. Despite the efforts of local Radio Shack dealers, the TRS-80 has not worked since the school opened.

After talking with Dr. Steve Davis at the school and writing the February story, *80 Micro* wrote to Ed Juge at Radio Shack to tell him about the problems the school is having with its 80. Ed wrote back saying that someone from Fort Worth was looking into the problem.

A few days after contacting Juge, Dr. Davis called the magazine. Things were really hopping in North Carolina! He had received several calls from Tandy execs, and soon after, help arrived in person. The fickle 80 is now in working order.

We hope that the students at NCSSM are enjoying their TRS-80 for the first time. ■

Microcomputing Titles Take Sales Lead in the Technical Market



If you can't judge a book by its cover, you can judge a book market by the number of covers published and sold. Although the market is only a few years old, a good guess suggests that there are already thousands of microcomputing titles in print. So far no independent organization has measured the scope of the market. Yet several publishers have reported first year press runs of over 100,000 copies for certain microcomputing titles. Reportedly, Tab Books Inc., Blue Ridge Summit, PA has two titles approaching a quarter million copies sold.

The possibilities of a publishing market based on microcomputing topics emerged in the mid seventies. Between 1974 and 1976 several people grasped the impact of microprocessors and coupled their insight with publishing rather than manufacturing. Adam Osborne and Rodney Zaks who started Sybex were among those who foresaw the future in terms of books.

The Early Days

Zaks recalls the time and the climate that spurred him to begin Sybex. Project Genie at the University of California's Berkeley campus was bringing academics together with industry to explore the potential of microprocessors. From Paris, Zaks brought the equivalent of doctorates

in math and engineering to Berkeley where he had a fellowship to study computer science.

"Because I had knowledge of both hardware and software and a great interest in the chips, I began lecturing and also working at the university." The demands for lectures began to take all the time Zaks could spare. In an attempt to ease the burden, he documented his knowledge and reproduced the visual aids he used during his talks. The material was bound in a book and 10 to 15 thousand copies were printed: All the copies sold within 10 days. Zaks says that besides seeing the potential of the market from first-hand experience, "I found I liked book writing."

Rudolph Langer, managing editor of Sybex, recalls early problems that were shared by all microcomputing publishers. "It's a lamentable fact that most technical writers know their field well, but can't represent that knowledge either visually or verbally." The problem was compounded by the lack of copy editors who comprehended the topic. Langer says many publishers had to "depend on the literacy of the academics who wrote for them and then did not edit the work at all."

Although problems communicating the material have endured, the microcomputing market continues to grow. At Mi-

cromedia Marketing, Inc., of Pasadena, CA, Zachary Bovinette says they cull the most successful books from various publishers and sell to book store chains, computer chains and electronics outlets nationwide. The company is a wholesale distributor.

Analyzing Sales

In order to keep track of which titles are most lucrative, Micromedia maintains a list of their best sellers. Although it is not meant to be a gauge of the overall market, it is the only overview that considers titles from a group of publishing houses. However, books from companies that do not deal through Micromedia, such as Radio Shack and Tab, are not evaluated. The sales that are considered represent only a portion of any book's sales, since most microcomputing publishers market their books independently as well.

Micromedia's current best seller has been on the market since November. In its first three months, it sold approximately 4,000 copies through Micromedia Marketing distribution. Bovinette guesses that that number may account for a third of the copies actually sold.

Considering the enthusiasm shared by publishers, Bovinette's estimate may be conservative. While publishers such as Sybex, Dillithium, Matrix, Osborne, Wayne Green, Winthrop, Reston, Tab, John Wiley, Howard Sams and Hayden all report some press runs as low as five to 10 thousand, most also report titles that are selling close to the 100,000 mark in their first year.

The Quarter Million Mark

At Sybex, Zaks says *Programming with the Z-80* sold "well over 100,000 in its first year and has been translated into at least three foreign languages." Several other Sybex titles reportedly sold close to 80,000 copies their initial year.

According to Anthony Curtis, managing editor of Tab Books, *The BASIC Cookbook* and *57 Programs & Games in BASIC* are each approaching a quarter million copies in print. Within the next year, Tab expects to have 100 titles on microcomputing for hobbyists and small businessmen. Curtis says the initial press run of all of their microcomputing titles is at least 10,000 now.

At Howard W. Sams, an electronics book publisher that is a subsidiary of International Telephone and Telegraph (ITT), Don Harrington was more guarded in

his response to questions. But he confirmed the strength of the market by saying that microcomputing books "at the present time are our fastest moving titles and the best selling area of our line."

Both Curtis and Harrington stress the importance of their companies' marketing divisions. At Tab, Curtis says titles are sold "wholesale to book stores worldwide through our network of 250 sales reps." Direct mail also accounts for a large share of the market with advertisements running concurrently in about 40 magazines. Book clubs, such as Tab's own Computer Book Club and the Electronics Book Club, provide another route to consumers.

Tab Books may have a longer marketing reach than other companies in the field, but the complexity of the network is typical. Besides book stores, direct mail and book clubs, many companies distribute their microcomputing titles through electronics stores. For instance, Microcomedia Marketing distributes titles to Computerland and MicroAge. Some companies, such as Prentice Hall's subsidiaries Winthrop and Reston, are also selling titles in schools.

The complexity of the market has so far prevented any organization from attempting to judge best selling technical books. Conversations with *New York Times* staff who help compile the best sellers lists indicate that the *Times* has begun to appreciate the magnitude of the technical publishing business but has no plans to monitor its sales at this time. Currently the *Times* tracks sales "based on computer-processed reports from book stores and representative wholesalers with more than 40,000 outlets across the United States." The chore of tracking best selling technical titles could be more grilling.

Belief in the Market

Despite the inability to get concrete figures on the overall market, major publishing houses such as McGraw-Hill, Houghton Mifflin and Random House are beginning to stick their fingers in the pie.

Publishers experienced with the market all project enduring strength and growth. Tab Book's Curtis said, "It's really hard to talk in dollars, especially with inflation, but I think there is something approaching a half a million microcomputers out there now, and by the end of 1982 there will be over a million. It's going to keep increasing, say at 50 percent a year, and, well, we can't keep the stuff in stock now."

At Winthrop manager Charles Durang sees a unique strength in microcomputing books. "In our normal book market there are certain life patterns. After a certain time everybody will have read a book that's going to read that book. In this market worries of obsolescence are mitigated because there's going to be a whole new audience every year," until microcomputers become as common as televisions.

Confirming the strength seen by Du-

rang and Curtis, Ed Ferman, associate publisher of Wayne Green Inc. of Peterborough, NH, compares the book market to the magazine market. The company currently publishes three magazines and an industry newsletter as well as books. Ferman predicts that "Books will eventually be the largest gross revenue in our publishing venture." ■

by Nancy Robertson
80 Staff

CONVERT YOUR TRS-80 MODEL-I INTO A DEVELOPMENT SYSTEM

Now you can develop Z-80 based, stand-alone devices such as games, robots, instruments and peripheral controllers, by using your TRS-80 as a development system. The DEVELOPMATE plugs into the expansion connector of your TRS-80 and adds **PROM PROGRAMMING** and **IN-CIRCUIT-EMULATION** capabilities to your system (with or without expansion interface).

Complete instructions and sample schematics are included to help you design your own simple stand-alone microcomputer systems. THESE SYSTEMS CAN BE AS SIMPLE AS FOUR ICs: one TTL circuit for clock and reset, a Z-80, an EPROM, and one peripheral interface chip.



When the In-Circuit-Emulation cable is plugged into the Z-80 socket of your stand-alone system, the system becomes a part of your TRS-80. You can use the full power of your editor/assembler's debug and trace programs to check out both the hardware and the software. Simple test loops can be used to check out the hardware, then the system program can be run to debug the logic of your stand-alone device.

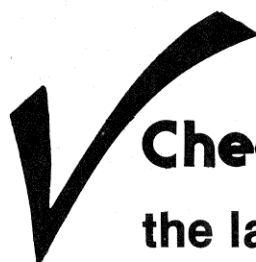
Since the program is kept in TRS-80 RAM, changes can be made quickly and easily. When your stand-alone device works as desired, you use the Developmate's PROM PROGRAMMER to copy the program into a PROM. With this PROM, and a Z-80 in place of the emulation cable, your stand-alone device will work by itself.

The DEVELOPMATE is extremely compact: Both the PROM programmer and the In-Circuit-Emulator are in one small plastic box only 3.2" x 5.4". A line-plug mounted power supply is included. The PROM programmer has a "personality module" which defines the voltages and connections of the PROM so that future devices can be accommodated. However, the system comes with a "universal" personality module which handles 2758, 2508(8K), 2716, 2516(16K), 2532(32K), as well as the new electrically alterable 2816 and 48016(16K EEPROMs).

The COMPLETE DEVELOPMATE 81, with software, power supply, emulation cable, TRS-80 cable, and "universal" personality module, is ONLY \$329! The PROM PROGRAMMER is available separately for ONLY \$239.



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**Check our book pages for
the latest books about
microcomputers.**

RFI Circuit

(Continued from page 62)

sitate the use of elaborate and expensive test gear and fixtures. Spectrum analyzers capable of operating at 1GHz (1,000 MHz) are only the beginning. Three, 10 or 30 meter test sites may be used providing they meet the site attenuation require-

ments the FCC deems appropriate. There are separate tests to determine if the test site is certifiable. Complete test records must also be kept, just in case the government wants to recreate the test to check the accuracy of the data.

What if the companies these engineers work for are unwilling or unable to conduct the RFI tests they need to get their

new equipment certified for sale? In that case, R&B Enterprises is capable of doing the testing for them. Robert Goldblum, President and Technical Director of R&B told *80 Microcomputing*, "Rates vary depending on the complexity of the test, and the type of unit under test. A ball park figure is around \$1,000 a session (day). Most micros or their peripherals can be tested in one or two sessions."

As the fatigued engineers file out of function room six at the end of the first day's seminar and head for the lounge, they talk of microvolts and meters. An intense core of people surround Mobley and barage him with questions.

"Which rotor is best to use in a turntable?"

"CDE's Ham M."

"Are there any alternatives to expensive, commercially calibrated dipole antennas?"

"No."

"Is \$20,000 a realistic figure to spend on a good quality spectrum analyzer for the 1GHz range?"

"Yes."

"In this new era of deregulation, why is the FCC sticking its nose in our business?"

"Heck, when the boys started building computers that interfered with Land Mobile, commercial, amateur and TV communications you got yourselves involved in our business. The commission is just tryin' to keep a lid on interference complaints. That's all." ■

by Chris Brown
80 Staff

80 CALENDAR

May

May 4-7 the 1981 National Computer Conference will be held at McCormick Place, Chicago. Microcomputing exhibits and the **Personal Computing Festival** will be included in the main exhibit area.

Professional Development Seminars, Arlington, VA is offering 21 seminars at McCormick Inn in conjunction with the conference. For more information, call (703) 588-3610.

The **National TRS-80 Microcomputer Show** will be held at the New York Statler Hotel Exposition Hall in New York City **May 21-23**.

Sponsored by Kengore Corp., Franklin Park, NJ and by *80 Microcomputing*, Peterborough, NH, the show will focus on the Radio Shack Model I, II, III, Color Videotex and Pocket Computers. There will be daily user-group seminars as well as a number of guest speakers. Contact Kengore Corp. for more information.

May 20-22, the Videotex 81 Conference and Exhibit will be held at the Royal York Hotel, Toronto, Canada. Sponsored by Informat, a Canadian videotex service organization, and by Online Conferences Ltd. of London, the conference will review topics under the headings of International Review, General & Business Interest and Industry. International videotex designs and equipment will also be displayed.

Videotex is a generic term referring to screen formatting of information that is transmitted via electronic networks.

For more information on the conference, contact Pam Carter, Videotex '81, Infomart, 122 St. Patrick St., Toronto, Ontario M5T 2X8 Canada.

June

The National Forum on Computers and Health, Alexandria, VA is offering a workshop called **Mini-computers and Microprocessors in Medical Practice Management**. It will be held **June 4-5** in Philadelphia. To register call (703) 549-8020 collect. The toll free number for Virginia residents is (800) 336-4776.

June 30 is the deadline for submissions for **The Johns Hopkins First National Search** for personal computing devices, programs and designs to aid the handicapped. The search is designed to "discover existing applications and to inspire new ideas for the application of personal computing to meet the needs of the handicapped," according to a press release from Johns Hopkins University.

A \$10,000 grand prize is offered along with 100 other awards. The three submission categories are defined as 1) Computer Based Devices which includes "hardware invented or modified for the purpose, or working hardware and software which can demonstrate a new application," 2) Computer Programs which means "specialized software and concepts for existing computers," and 3) System Concept/Design, which is "written descriptions of ideas not yet implemented."

The competition is being sponsored by grants from The National Science Foundation and by Radio Shack.

For more information, write Personal Computing to Aid the Handicapped, The Johns Hopkins University, P.O. Box 670, Laurel, MD 20810.



Milt Mobley at the Podium

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| <input type="checkbox"/> ADVENTURE HINT BOOK | 7.95 |
| <input type="checkbox"/> ADVENTURE #0 | 6.25 |
| <input type="checkbox"/> ADVENTURE (1,2,3) [D] | 35.95 |
| <input type="checkbox"/> ADVENTURE (4,5,6) [D] | 35.95 |
| <input type="checkbox"/> ADVENTURE (7,8,9) [D] | 35.95 |
| <input type="checkbox"/> ADVENTURE #10 [D] | 18.95 |
| <input type="checkbox"/> ADVENTURE (specify 1-10) | 13.55 |
| <input type="checkbox"/> MEAN CHECKERS MACHINE | 17.95 |
| <input type="checkbox"/> MEAN CHECKERS MACHINE [D] | 22.95 |
| <input type="checkbox"/> DR CHIPS | 13.55 |
| <input type="checkbox"/> DR CHIPS [D] | 17.95 |
| <input type="checkbox"/> INTER FICTION SAMPLER [D] | 13.55 |
| <input type="checkbox"/> INTER-LOCAL CALLS [D] | 17.95 |
| <input type="checkbox"/> INTER-TWO HEADS [D] | 17.95 |
| <input type="checkbox"/> INTER-IMPETUOUS [D] | 17.95 |
| <input type="checkbox"/> KID-VENTURE 1 | 13.55 |
| <input type="checkbox"/> STAR TREK 3.5 | 13.55 |
| <input type="checkbox"/> STAR TREK 3.5 [D] | 17.95 |
| <input type="checkbox"/> ZOSED IN SPACE | 13.55 |
| <input type="checkbox"/> MACES #1, BARLOG | 31.00 |
| <input type="checkbox"/> MACES #1, SISYPHUS | 31.00 |
| <input type="checkbox"/> LUNAR LANDER | 13.55 |
| <input type="checkbox"/> LUNAR LANDER [D] | 18.95 |
| <input type="checkbox"/> POKER | 13.55 |
| <input type="checkbox"/> GALACTIC TRILOGY [D] | 35.95 |

ACORN SOFTWARE

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| <input type="checkbox"/> ATERM | 17.95 |
| <input type="checkbox"/> SYSTEM SAVERS | 13.55 |
| <input type="checkbox"/> TING-TONG | 8.95 |
| <input type="checkbox"/> DISASSEMBLER | 13.55 |
| <input type="checkbox"/> DISK/TAPE UTILITY | 17.95 |
| <input type="checkbox"/> CHECKBOOK [D] | 22.95 |
| <input type="checkbox"/> STAR TREK SIMULATION | 8.95 |
| <input type="checkbox"/> CODEBREAKER | 8.95 |
| <input type="checkbox"/> OPERA THEATER | 8.95 |
| <input type="checkbox"/> GAMMON CHALLENGER | 13.55 |
| <input type="checkbox"/> BLACKADE | 8.95 |
| <input type="checkbox"/> PIGSKIN | 13.55 |
| <input type="checkbox"/> STRUCTURED BASIC [D] | 26.95 |
| <input type="checkbox"/> ULTRA TREK | 13.55 |
| <input type="checkbox"/> SPACE WAR | 8.95 |
| <input type="checkbox"/> WARP/LANDER | 8.95 |
| <input type="checkbox"/> BASKETBALL [D] | 18.95 |
| <input type="checkbox"/> BASKETBALL | 13.55 |
| <input type="checkbox"/> DUEL-N-DROIDS [D] | 18.95 |
| <input type="checkbox"/> DUEL-N-DROIDS | 13.55 |
| <input type="checkbox"/> INVADERS FROM SPACE | 13.55 |
| <input type="checkbox"/> INVADERS FROM SPACE [D] | 18.95 |
| <input type="checkbox"/> PIGSKIN [D] | 18.95 |
| <input type="checkbox"/> PINBALL | 13.55 |
| <input type="checkbox"/> PINBALL [D] | 18.95 |
| <input type="checkbox"/> QUAD | 13.55 |
| <input type="checkbox"/> QUAD [D] | 19.95 |
| <input type="checkbox"/> SUPERSCRIP [D] | 28.95 |

HAYDEN

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| <input type="checkbox"/> SARGON II | 25.00 |
| <input type="checkbox"/> SARGIN II [D] | 30.00 |

AUTOMATED SIMULATION

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| <input type="checkbox"/> STAR WARRIOR [CASS. OR DISK] | 35.95 |
| <input type="checkbox"/> THREE PACK [D] | 45.00 |
| <input type="checkbox"/> STARFLEET [CASS. OR DISK] | 22.50 |
| <input type="checkbox"/> INVASION [CASS. OR DISK] | 22.50 |
| <input type="checkbox"/> APSHAH [CASS. OR DISK] | 26.95 |
| <input type="checkbox"/> RYN [CASS. OR DISK] | 17.95 |
| <input type="checkbox"/> MORLOC [CASS. OR DISK] | 17.95 |
| <input type="checkbox"/> RIGEL [CASS. OR DISK] | 22.50 |
| <input type="checkbox"/> HELLFIRE [CASS. OR DISK] | 26.95 |

BIG FIVE SOFTWARE

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|---|-------|
| <input type="checkbox"/> ATTACK FORCE (MODEL 1 OR 3) | 14.55 |
| <input type="checkbox"/> GALAXY INVASION (MODEL 1 OR 3) | 14.55 |
| <input type="checkbox"/> METEOR MISSION (MODEL 1 OR 3) | 9.95 |
| <input type="checkbox"/> SUPER NOVA (MODEL 1 OR 3) | 14.55 |
| <input type="checkbox"/> COSMIC FIGHTER (MODEL 1 OR 3) | 14.55 |

COMPUTER SIMULATIONS COMPANY

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| <input type="checkbox"/> BATTLE OF BULGE-BASTOGNES | 17.95 |
| <input type="checkbox"/> D-DAY INVASION OF FRANCE | 17.95 |
| <input type="checkbox"/> DARK KINGDOM | 11.75 |
| <input type="checkbox"/> DOG RACE, COLOR ONLY [C] | 5.95 |
| <input type="checkbox"/> ELECTRIC ALARM | 4.95 |
| <input type="checkbox"/> EMPIRE STRIKES BACK | 13.55 |
| <input type="checkbox"/> GREAT DICTATOR | 7.25 |
| <input type="checkbox"/> JEDI KNIGHT | 11.75 |
| <input type="checkbox"/> LUNAR ENCOUNTER | 11.75 |
| <input type="checkbox"/> MERCENARY | 8.95 |
| <input type="checkbox"/> MICRO ARCADE | 13.55 |
| <input type="checkbox"/> SHARK, COLOR ONLY [C] | 5.95 |
| <input type="checkbox"/> SLOT MACHINE | 7.25 |
| <input type="checkbox"/> BATTLE OF BULGE-ST. VITH | 13.55 |
| <input type="checkbox"/> STAR CRUISERS | 13.55 |
| <input type="checkbox"/> TYPE WRITERS | 17.95 |
| <input type="checkbox"/> U-BOAT, COLOR ONLY [C] | 5.95 |
| <input type="checkbox"/> ORION WAR, COLOR ONLY [C] | 5.95 |
| <input type="checkbox"/> POLARIS, COLOR ONLY [C] | 5.95 |

INSTANT SOFTWARE

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| <input type="checkbox"/> AIR FLIGHT SIMULATION | 7.25 |
| <input type="checkbox"/> AIRMAIL PILOT | 8.95 |
| <input type="checkbox"/> ALL STARS [D] | 31.55 |
| <input type="checkbox"/> ASTEROIDS [D] | 17.95 |
| <input type="checkbox"/> ASTEROIDS | 13.55 |
| <input type="checkbox"/> BASIC PROGRAMMING ASSISTANT | 13.55 |
| <input type="checkbox"/> BALL TURRET GUNNER | 8.95 |
| <input type="checkbox"/> BATTLEGROUND | 8.95 |
| <input type="checkbox"/> CHECK MANAGEMENT [D] | 36.55 |
| <input type="checkbox"/> CHESSMATE-80 | 17.95 |
| <input type="checkbox"/> THE COMMUNICATOR | 8.95 |
| <input type="checkbox"/> COSMIC PATROL | 13.55 |
| <input type="checkbox"/> COSMIC PATROL [D] | 17.95 |
| <input type="checkbox"/> DAREDEVIL | 8.95 |
| <input type="checkbox"/> DISASSEMBLER | 8.95 |
| <input type="checkbox"/> DISK EDITOR [D] | 36.55 |
| <input type="checkbox"/> DISK SCOPE [D] | 17.95 |
| <input type="checkbox"/> DLDIS [D] | 17.95 |
| <input type="checkbox"/> DEVICE DRIVERS | 17.95 |
| <input type="checkbox"/> ENHANCED BASIC | 22.50 |
| <input type="checkbox"/> ELEC REPT GEN | 8.95 |
| <input type="checkbox"/> FLIGHT PATH | 8.95 |
| <input type="checkbox"/> FLYING CIRCUS [D] | 36.55 |

INSTANT SOFTWARE

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| <input type="checkbox"/> GEOGRAPHY [D] | 45.00 |
| <input type="checkbox"/> I.Q. TEST | 8.95 |
| <input type="checkbox"/> INVADERS | 8.95 |
| <input type="checkbox"/> INVESTORS PARADISE | 8.95 |
| <input type="checkbox"/> IRV [D] | 22.50 |
| <input type="checkbox"/> JET FIGHTER PILOT | 27.55 |
| <input type="checkbox"/> MIND WARP | 13.55 |
| <input type="checkbox"/> MONEY MADNESS | 8.95 |
| <input type="checkbox"/> NIGHT FLIGHT | 8.95 |
| <input type="checkbox"/> ONE-D MAILING LIST [D] | 22.50 |
| <input type="checkbox"/> OTHELLO | 8.95 |
| <input type="checkbox"/> PROGRAMMER'S CONVERTER | 8.95 |
| <input type="checkbox"/> QSL MANAGER [D] | 17.95 |
| <input type="checkbox"/> SANTA PARAVIA FIUMACCIO | 8.95 |
| <input type="checkbox"/> SKIRMISH-80 | 8.95 |
| <input type="checkbox"/> TERMINAL-80 | 22.50 |
| <input type="checkbox"/> TLDIS | 13.55 |
| <input type="checkbox"/> UTILITY I | 7.25 |
| <input type="checkbox"/> UTILITY II | 7.25 |
| <input type="checkbox"/> WINNERS DELIGHT | 8.95 |
| <input type="checkbox"/> WORDSLINGER | 26.00 |

PERSONAL SOFTWARE

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| <input type="checkbox"/> CCA MGMT-TRS-80 | 65.00 |
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QUALITY SOFTWARE

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| <input type="checkbox"/> DEBUG | 13.55 |
| <input type="checkbox"/> FASTGAMMON | 17.95 |
| <input type="checkbox"/> LOWBALL POKER | 10.45 |
| <input type="checkbox"/> BANKSHOT | 8.95 |
| <input type="checkbox"/> POKER PETE | 10.45 |
| <input type="checkbox"/> RUMMY MASTER | 10.45 |
| <input type="checkbox"/> 3D TIC TAC TOE | 13.55 |
| <input type="checkbox"/> QS LIGHT PEN | 17.95 |
| <input type="checkbox"/> SKETCH 80 | 13.55 |

STRATEGIC SIMULATIONS

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|--|-------|
| <input type="checkbox"/> COMPUTER BISMARCK [D] | 51.50 |
| <input type="checkbox"/> COMPUTER BISMARCK | 42.00 |

SUB-LOGIC

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|---|-------|
| <input type="checkbox"/> T80-FS1 FLIGHT SIMULATOR | 22.00 |
| <input type="checkbox"/> 3D GRAPHICS | 26.50 |

BOTTOM SHELF

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|---|--------|
| <input type="checkbox"/> ANALYSIS PAD [D] | 90.00 |
| <input type="checkbox"/> BASIC TOOLKIT | 17.80 |
| <input type="checkbox"/> BUSINESS MAIL [D] | 100.00 |
| <input type="checkbox"/> CHECKBOOK II [D] | 44.50 |
| <input type="checkbox"/> CHECK REGISTER [D] | 67.00 |
| <input type="checkbox"/> DATA MANAGER [D] | 67.00 |
| <input type="checkbox"/> HEAD CLEANER [D] | 17.00 |
| <input type="checkbox"/> INFO SYSTEM [D] | 44.50 |
| <input type="checkbox"/> LIBRARY 100 | 44.50 |
| <input type="checkbox"/> SYSTEM DOCTOR [D] | 35.50 |
| <input type="checkbox"/> SYSTEM DOCTOR | 26.00 |

MICROSOFT SOFTWARE

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| <input type="checkbox"/> ADVENTURE [D] | 25.50 |
| <input type="checkbox"/> ASSEMBLY DEVELOPMENT [D] | 80.00 |
| <input type="checkbox"/> BASIC COMPILER [D] | 175.00 |
| <input type="checkbox"/> EDITOR/ASSEMBLER | 25.00 |
| <input type="checkbox"/> FORTRAN COMPILER [D] | 80.00 |
| <input type="checkbox"/> LEVEL III BASIC | 44.00 |
| <input type="checkbox"/> MUMATH [D] | 64.00 |
| <input type="checkbox"/> OLYMPIC DECALON [CASS. OR DISK] | 20.00 |
| <input type="checkbox"/> TYPING TUTOR | 13.55 |

If you don't see it listed, write...we probably have it in stock!

Check program desired.
Complete ordering information
and mail entire ad.
Immediate Shipments from stock.

KEY:

C- TRS-80 Color

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Ship the above programs as checked to:

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Address _____

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I have a _____
name of Computer

with _____ K memory

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Amount of order _____

N.Y. residents add Sales Tax _____

Add shipping anywhere in the U.S. **2.00**

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Charge my: ☐ Master Charge ☐ Visa

Signature _____

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Prices subject to change without notice.

NEW PRODUCTS

Edited by Chris Crocker

Terminal Program Provides Local Functions

Omniterm is an intelligent terminal program that lets the TRS-80 perform all necessary translation when connected to other computers. The program provides local functions, such as the ability to review text that has scrolled off the screen and single-key automatic sign-on.

Omniterm runs on a 32K TRS-80 with one disk drive and RS232-C interface. The program costs \$95. For more information contact Lindbergh Systems, 49 Beechmont St., Worcester, MA 01609.

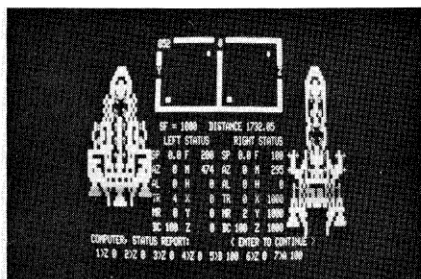
Reader Service ✓341

Ships Combat in Space

Space Ace 21 is a space combat simulator in which two opponents design their own space fighters. The craft start at a distance and then maneuver and attack. The program requires a 16K Model I or III and Level II BASIC, and costs \$19.95.

In Parsector V, you and your opponent must navigate ships through space and capture parsectors—units of space owned by an intelligent entity. The program requires 16K Level II on Model I or III and costs \$20.95.

For more information contact Synergistic Solar Inc., P.O. Box 560595, Miami, FL 33156.



Space Ace 21

Program Formats Text

TEX Version 2.0 is an updated edition of the TEX Text Formatting Program. A TEX input file contains text interspersed with commands. From this, the program outputs a paginated document file whose format is determined by the user's commands. TEX 2.0 can generate an index and table of contents, produce super and subscripts, accept insertions, and chain source files.

TEX 2.0 is compatible with all versions of CP/M. A text editing program is required to produce the input file. No prices were released. For more information, contact Digital Research, P.O. Box 579, 801 Lighthouse Ave., Pacific Grove, CA 93950.

Reader Service ✓331

Gospel Quiz

Questions and Answers from the Gospel of Luke provides four groups of ten questions. Each answer elicits a corresponding explanation.

A printed reference is included, listing the scriptural source of each question, answer and explanation. A cassette for 16K Level II TRS-80 costs \$5 from Next In Line, Inc., P.O. Box 10295, Tampa, FL 33609.

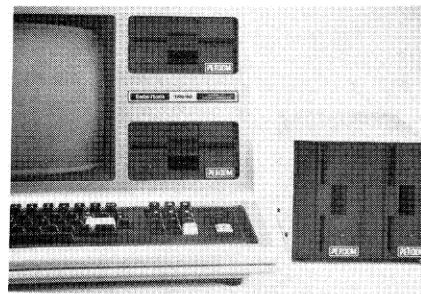
Reader Service ✓332

Leadership Analysis Software

The Leadership Analysis Program is an automated analysis that reveals character traits, including areas of potential leadership and areas of potential conflict. The program administers a battery of exercises, performs the analysis, and prints a personalized report with graphs.

The Leadership Analysis Program requires a 48K Model I with one disk drive and costs \$995 from Citation Group, 13 Langhorne Rd., Chalfont, PA 18914.

Reader Service ✓336



Percom Drives for Model III

Drives Install In Model III

Mini-disk storage systems for the Model III from Percom may be ordered with either 40 or 80 track drives. Two Model III drives mount inside the computer; drives three and four connect externally.

The first internal drive system costs \$749.95 in the 40 track version and \$914.95 in the 80 track version. The second internal drive costs \$315 for 40 tracks and \$474.95 for 80 tracks. For more information contact Percom Data Co., 211 N. Kirby, Garland, TX 75042.

Reader Service ✓162

Analog and Digital Port Interfaces

The Design Solution Model AN-538 analog port interface provides both analog to digital and digital to analog converters. The unit also houses a mini-digital port interface with latched eight-bit data output to the digital to analog converter and eight decoded device control lines.

The Design Solution Model AN-511 digital port interface provides eight bits of input and output data to the TRS-80, eight device control lines and an eight bit data bus. Using the IN and OUT commands, information can be transferred to and from

The New Products section is intended to inform our readers of new products on the market. All information in the section is taken from product releases sent by manufacturers. Because of the volume of product releases, we cannot attest to the quality of the products listed.

NEW PRODUCTS



Design Solution Analog Port Interface

the TRS-80.

Each model costs \$79.95 from the Design Solution Facility, P.O. Box 1225, Fayetteville, AR 72701.

Reader Service ✓340

Inventory Records, Tapes

Audiophile Library System (ALS) inventories collections of records or tapes. Selections are stored by record number, tape number, title of selection, composer, artist(s), conductor, orchestra and source.

ALS operates on Models I and III with TRSDOS and at least one disk drive. The system costs \$20.95 from GB Assoc., P.O. Box 3322, Granada Hills, CA 91344.

Reader Service ✓342

COBOL Information Bulletin

The American National Standards Institute (ANSI) has a committee evaluating COBOL. COBOL Information Bulletin (CIB) 20 is available from the institute to explain the latest standard considerations.

CIB 18, 19 and 20 are all being sold by ANSI, a nonprofit organization. CIB 20 costs \$7; 18 and 19 cost \$6 each. Checks should be made payable to X3 Secretariat, and mailed to CBEMA, 1828 L Street, N.W., Suite 1200, Washington, DC 20036 along with a stamped, self-addressed envelope.

Program Charts Stocks

Stockchart-I is a stock charting program for the Model I Level II with 16K. The program enables generation of a stock

price chart using the high, low and close stock prices. Stockchart-I also has a routine which will signify price trend reversal.

The cassette version costs \$30 and the disk version costs \$50 from Micro-Investment Software, 9621 Bowie Way, Stockton, CA 95209.

Reader Service ✓170

Package Plots Graphs

Plot-80 is a software plotting package for both dot matrix and daisy wheel printers. Plot-80 is for use with the TRS-80 Model I with 48K, one disk drive, and one of several graphics printers. The system is geared towards the plotting of graphs and histograms with numbered and labeled axes.

Plot-80 is available on a formatted disk (specify track format). Single drive owners must supply a disk with operating system or add \$15 to the package cost for a TRSDOS disk. The program operates with Base-2, Paper Tiger (with graphics option), Gencom, Qume, Xerox, Diablo and NEC Spinwriter. Printer and interface must be specified when ordering. The program costs \$99.95 from Microcomputer Specialists, P.O. Box 11295, Elkins Park, PA 19117.

Reader Service ✓171

Color Computer News

The Color Computer News is a publication for users of the Radio Shack Color Computer. The newsletter will feature news, software tips, and will provide a forum for Color Computer users. Publication will be bi-monthly until the volume of information requires more frequent release.

The subscription rate is \$9 per year or \$2 per issue; from REMarkable Software, P.O. Box 1192, Muskegon, MI 49443.

Reader Service ✓173

Word Processor Has 19 Commands

Word-M3 is a text processing program for the Model III that accepts lines of text with lines of format control information included. The program formats text into a document. There are 19 commands.

Word-M3 operates on TRSDOS for the Model III and costs \$49. For more information contact Micro Architect, Inc., 96 Dothan St., Arlington, MA 02174.

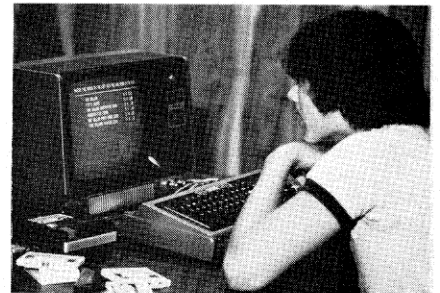
Reader Service ✓348

Software for Special Needs

A series of microcomputer educational programs from Interpretive Education are designed for special needs audiences. Included in the series of programs are: Poison Proof Your Home, Income Meets Expenses, You Can Bank On It, Home Safe Home, Money Management Assessment Series and Job Readiness Assessment and Development.

The programs are available on cassette for TRS-80 Model I, Level II with 16K. The packages contain from four to eight cassettes and range in price from \$125 to \$340 per program. For more information, contact Interpretive Education, Dept. NR, 2306 Winters Dr., Kalamazoo, MI 49002.

Reader Service ✓343



Special Needs Software

Utility Speeds BASIC Programs

Faster is a software speed-up utility for TRS-80 Model I Level II and Disk BASIC programs. It analyzes programs, and then displays or prints information enabling the user to change programs to reduce execution time.

Faster is available from Prosoft, Box 839, N. Hollywood, CA 91603.

Reader Service ✓166

Space Game, Role-playing Adventure

Hellfire Warrior is a fantasy role-playing sequel to Temple of Apshai in which the player rescues a maid from a four-level dungeon. Star Warrior is a program in which the player must fight a planetary force of storm troopers and nine military vehicles.

Star Warrior and Hellfire Warrior are

available on cassette for 16K Level II, and on disk for 32K. Star Warrior is also available on disk for 16K Level II. The programs cost \$39.95 each from Automated Simulations, P.O. Box 4247, Mountain View, CA 94040.

Reader Service ✓330

Color Computer Software

CBUG Monitor Tape is a software package for exploring the Color Computer at the assembly language level. The package allows you to examine or change memory using a formatted hex display, save areas of memory to cassette in binary, and send or receive RS232 at up to 9600 baud.

The monitor has 19 commands in all, and is relocatable. The monitor costs \$29.95. CBUG Monitor ROM is an identical program supplied in ROM that costs \$39.95.

The 80C Disassembler runs on the Color Computer and allows you to generate a source listing of the BASIC interpreter ROM. The 80C Disassembler requires 16K and costs \$49.95. For more information contact The Micro Works, P.O. Box 1110, Del Mar, CA 92014.

Reader Service ✓350

CBASIC Runs Under TRSDOS

CBASIC 2.27 provides users with the same features as CP/M, but operates under TRSDOS for the TRS-80 Model II. The system includes files supporting unlimited length records and full format control of printed reports.

CBASIC will be available on a TRSDOS disk with a text editor for \$250. For further information contact Compiler Systems, Inc., P.O. Box 145, Sierra Madre, CA 91024.

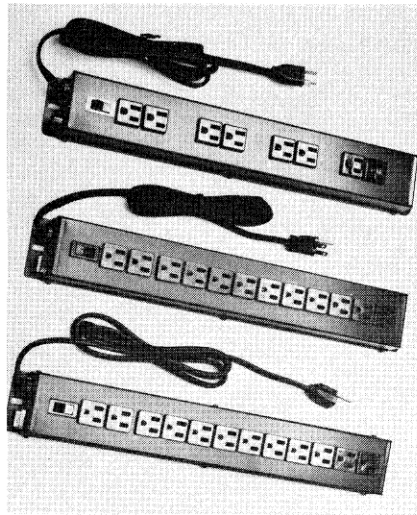
Reader Service ✓167

Port-addressed Clock

The 80 Clock is a real-time hardware clock with battery back-up. The clock connects to the expansion or screen printer port without restricting use of that port. The clock gives the day of the month, day of week, the month, and time to thousandths of a second.

The 80 Clock costs \$70, and with optional output, \$80. For more information contact P and A Electronics, 921 Montclair, Olathe, KS 66061.

Reader Service ✓347



MFJ Multi-outlet ac Power Strips

Multi-outlet ac Power Strips

Multi-outlet ac Power Strips from MFJ eliminate interaction caused by power-line coupling between floppies, printers, processors and other peripherals. The power line strips also eliminate power-line spikes that cause memory loss, errors, and erratic operation.

The MFJ-1107 has eight sockets. Three pairs of sockets isolate the computer and peripherals from each other and from the power line, each pair with double pi rfi filters. The MFJ-1106 with varistor voltage spike protection is like the MFJ-1107, except that it has 12 sockets and one rfi filter for all sockets. The MFJ-1105 is like the 1106 except without rfi protection.

The MFJ-1105 costs \$43.95, the MFJ-1106 costs \$53.95, and the 1107 costs \$73.95. For more information contact MFJ Enterprises, P.O. Box 494, Mississippi State, MS 39762.

Reader Service ✓349

Educational Game Programs

Galactic Guardian and Guillotine are additional activities to supplement the Individual Study Center from TYC Software. Galactic Guardian presents questions and answers in a space game format. The student is asked to save the galaxy from invading spacemen by correctly responding to questions on the Subject Data Tape.

Guillotine is a variation of the game

hangman. The student's job is to save the man on the screen by correctly answering the questions presented.

Both programs are on a single cassette, and can only be used with the Individual Study Center's Subject Data Tapes. The programs are for 16K TRS-80. For more information contact TYC Software, 40 Stuyvesant Manor, Geneseo, NY 14454.

Reader Service ✓163

Business Systems Produce Reports

Mailbase 80 from Bourrut Consulting Corp. is a mailing system that permits entry in any sequence. The program produces such reports as Entry Report, Entries Added to Master Report, and a New Key Report. The program costs \$229.

Oilman, also from Bourrut Consulting, handles functions and produces reports for the oil industry. It can work off degree days, will calls and/or dated accounts. Oilman costs \$5500.

The programs operate on the Tandy II or Model II and are available from Bourrut Consulting Corp., 21 Friendly Rd., Smithtown, NY 11787.

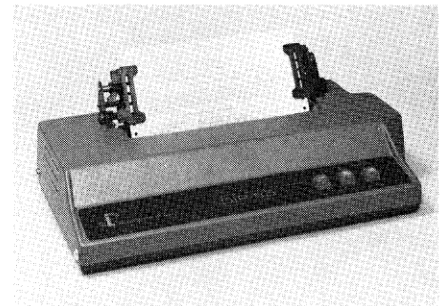
Reader Service ✓346

Printer Features Six Character Sizes

The model DIP-85 Data Impact Printer features 7 x 7 or 14 x 7 dot matrix, six different character sizes and 100 character per second print speed. The printer has variable line density and continuous form length controls, and will print in upper and lowercase.

The DIP-85 will accept parallel or RS-232-C communications. For more information, contact DIP, Inc., 745 Atlantic Ave., Boston, MA 02111.

Reader Service ✓335



DIP-85 Data Impact Printer

Print Lowercase Without Modification

Lazy Writer is a word processing program that permits uppercase and lowercase output to the printer (if printer accepts lowercase) without computer modification. One command will capitalize the first letter of all sentences and the pronoun I.

The package is available for TRS-80 Model I with 32K and at least one disk drive. Lazy Writer costs \$125 and is available from Soft Sector Marketing, Inc., 6250 Middlebelt, Garden City, MI 48135.

Reader Service ✓165

Operating System Offers Keyed File Access

The Oasis version 5.5 operating system is a multi-user time sharing system for Z-80 microcomputers. The operating system features keyed file access and media independent back-up, and lets up to 15 users share a single printer with its spooler.

The new version includes BASIC with reentrant run-time module, compiler and interpreter, EXEC interactive job control language, text editors, relocating macro assembler, debugger, linkage editor and diagnostic conversion programs.

Oasis 5.5 costs \$500 for single-user and \$850 for multi-user options. For more information contact Phase One Systems, 7700 Edgewater Dr., Suite 830, Oakland, CA 94621.

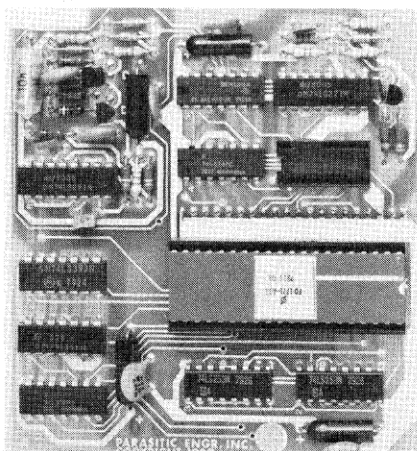
Reader Service ✓344

Scientific Subroutines

The Scientific Subroutine Library (SSL) is a collection of 72 subroutines for scientific, statistical, and engineering applications. The package includes routines to do multiple and polynomial regressions, Fourier transforms, solutions to differential equations by the fourth order Runge-Kutta method, matrix inversion, and solutions to Eigenvalue problems.

The programs come on a single disk in the form of relocatable object code, and can be used with several of Microsoft's high-level languages and assemblers. The package costs \$99.95. For information contact American Computer Development, Inc., 1735 Briarcrest Dr., Suite 200, Bryan, TX 77801.

Reader Service ✓160



5" Data Separator

Disk Error Protection

The Five-inch Data Separator helps eliminate disk errors, including track locked out and disk I/O errors. The data separator uses a phase locked loop circuit. The circuit adjusts itself to match the data from the disk drive, according to Parasitic Engineering.

The Five-inch Data Separator plugs into the expansion interface, and costs \$250. For more information contact Parasitic Engineering Inc., 1101 Ninth Ave., Oakland, CA 94606.

Reader Service ✓169

Directory Lists Pre-college Software

School Microware is a directory of educational software for the Apple, Pet and TRS-80. The directory describes programs for use in teaching and learning most pre-college subjects at all grade levels.

School Microware is available for \$20 per year (September full directory and three updates) from Dresden Assoc., P.O. Box 246, Dresden, ME 04342. Add \$5 per year for foreign subscriptions.

Reader Service ✓334

Voice Entry Terminal

The Scott VET/2 is a voice entry terminal for the TRS-80 Model I that connects to the screen printer I/O port. The VET/2 recognizes words or phrases by comparing the pattern and features of the words entered in analog form with the digitized

vocabulary in storage.

The terminal requires an expansion interface, 16K of additional memory and a disk drive. No prices were released. VET/2 is available from Scott Instruments, 815 North Elm, Denton, TX 76201.

Reader Service ✓168

Power Line Protection

The Spike-Spiker Mini-I features two grounded outlets and plugs directly into a 120 volt wall outlet. The Mini-I provides protection from most power line transients. The Spike-Spiker Mini-II is also a two grounded outlet wall-mounted unit that provides rf hash filtering of conducted interference, in addition to protecting against power line surge.

No prices were released. For more information, contact Kalglo Electronics Co., Inc., Colony Drive Industrial Park, 6584 Ruch Rd., East Allen Twp., Bethlehem, PA 18017.

Reader Service ✓338

Model I BASIC Enhancement

NEWBASIC adds new commands and utilities to TRS-80 Model I Level II or Disk BASIC. Utilities included are BASIC key-word entry, blinking block cursor, auto key repeat, and enabling of lowercase display. Also included are new graphics commands, ability to input from or output to the RS232-C interface, a video to printer echo, and GOTO and GOSUB to expressions or labels.

The Disk BASIC version of NEWBASIC costs \$29.95, while the Level II cassette version costs \$19.95. Both are available from Modular Software Assoc., 3533 Prospect Ave., Glendale, CA 91214.

Reader Service ✓333

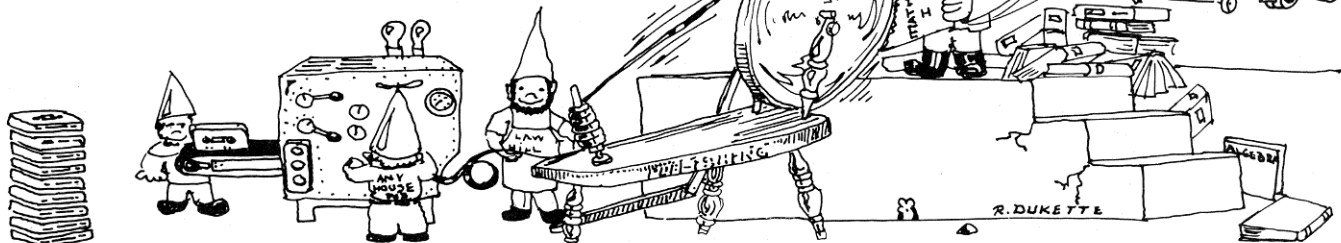
Utility Catalogs Disks

DISCAT is a disk cataloging and indexing utility. The utility keeps track of programs in a categorized library. A 48K system can provide indexes of nine categories, each containing 1900 entries, according to Racet Computes.

DISCAT operates with TRSDOS, NEW-DOS+, and NEWDOS 80. The program is available from Racet Computes, 1330 N. Glassell, Suite M, Orange, CA 92667.

Reader Service ✓161

Rushing Toward Courseware



by Pamela Petrakos
80 Staff

Computerized instruction is taking its seat in the American classroom. And it's bringing its own sort of course materials—magnetic.

At the same time large publishing companies are taking aim on an unfamiliar target in hopes of maintaining a market for its bread and butter mainstay, the textbook. Traditional publishers are anxiously testing their new wares from spelling and sound packages to management packages that will do the teacher's homework.

But computerized instruction stands on very uncertain ground. Publishers and educators alike know an educational revolution is here, but can only speculate as to how large an impact it will have in the traditional classroom.

Marketing statistics also convey the same kind of uncertainty. An increasing number of schools across the country are experimenting with computerized instruction but is there a high-volume market for educational software specialists?

Tandy Bargain

When Tandy Corporation recently struck its bargain with publishing giant Random House to distribute both software and Tandy hardware to school systems nationwide, *80 Microcomputing* tracked down a number of other publishing executives to assess their commitment or even awareness of the magnetic publishing market. What were their dollar

projections for the computerized instruction market; not only software, but accompanying texts and documentation?

80 found a surprising level of activity among most book publishers, but few verifiable statistics about the depth of this new market. No one seems to know how much the educational software market will grow. Studies have been done, but, on the whole, the market is ill-defined. Figures of projected courseware sales and speculations as to the number of micros that are expected to be in the schools vary widely.

Publishers' commitments varied from a "wait and see" attitude, to one company that has created an electronic publishing division. Yet another company, Boston's Houghton Mifflin, has invested in an electronic subsidiary, Time Share Corporation. Originally charged with creating classroom courseware for Houghton, TSC has just recently introduced the first microcomputer specifically designed for the classroom. What has motivated these traditional publishers to become involved in what appears to be a huge market, but at the same time, such an illusive one?

Partially because they are already in the education business and are committed to being a part of its growth. Robert Bowen, group vice president of the school division of McGraw-Hill said, "As a publisher, we see the responsibility and need to service the technology that is out there."

Bowen said he has heard predictions that by 1985 a million microcomputers will be in our schools; similarly courseware sales are projected at \$100 to \$150 million by 1985. However, Bowen said, he has a hard time accepting those particular figures.

"A \$150 million market would mean that the courseware market would be roughly equivalent to what we are spending now

for basic math programs. That is a very sizable market; I really think that by 1985 a more realistic estimate would be in about the \$30 million range," he said.

Varied Statistics

Classroom Computer News, a periodical dedicated to computers in education, in their January/February issue cites an educational technology consultant Harvey Brudner, who says that "Schools now spend three and a half percent of their learning materials budget for computers and accompanying software." He predicts a "400 percent growth over the next five years, bringing computer-related sales to schools to \$300 million or 14 percent of the total learning materials budget."

Yet, another report done in 1980 at the Center for Information Processing at the California State University in Fresno says, "Some form of computerized learning programs are presently utilized in 54 percent of the school districts in the United States and are projected to increase to 74 percent utilization in five years, at which time they will be the leading application of computers in education."

Creative Strategies International, a marketing firm, said in a report on microcomputers in education in October 1980, that "The educational microcomputer market will grow substantially by 1985, with an overall compound annual growth rate in excess of 30 percent per year. Some sectors will grow more rapidly than others. By 1985 retail value of educational microcomputer sales will approach \$350 million per year, up several hundred percent from its current level. The potential market for microcomputers is estimated at more than 1.4 million units, with market saturation presently low."

Continue to page 79

PMC-80 MODEL I

MISSILE ATTACK. By the Cornsoft Group. New for the PMC-80. This program is a machine language imitation of the arcade game called Missile Command. This real-time machine language game (with sound effects) pits your twin silos of ABM's against a barrage of enemy missiles trying to destroy your cities. As your skill increases so does the difficulty of this ever popular arcade game! Watch the skies and may your aim be true. TRS or PMC-80, cassette, 16K, **\$14.95**
TRS, disk, 32K, **\$20.95.**

TAPE COPY 1. ©1981 S.S.M., Inc. New for the PMC-80. This program is to solve the problem that has caused problems for all PMC-80 owners.

Problem: A machine language program will not load in the cassette player provided in the machine and you can't load a machine language program on the second cassette port. **This is a problem no more!** This program will load a machine language program from the second cassette player and saves it in the built-in cassette player. Loads and saves most all TRS-80 readable tapes that load at 500 baud (the standard speed). PMC-80 only, cassette **\$14.95.**

CONQUEST. ©1981 by Lake Front Software. This program is based on the popular board game called 'Risk'. (The names have been changed to protect the innocent.) This game is for one or more people. It is a game that demands attack strategy and, if yours is the best, you will be the 'Lord and Master' of the planet. MOD I, III or PMC-80. Requires 16K memory, cassette, **\$14.95.**

FLIPPY. Ver. 1.3. ©1981 by J. Limkemann. This is a machine language program that plays "the best game of Othello on the TRS-80 that I have seen, and I play a lot of Othello". (Victor Andrews) MOD I or III. Requires 16K memory. **\$14.95.**

Just because I can sell something is not a reason for a product to appear in my ad; I must believe in it myself.

The following pages contain new items that I believe in. I am not after only one sale; I want return business, and that means I must give you quality products every time.

I believe I sell only quality products. If you have a problem, send your comments addressed to me. We support every product we sell.

Victor Andrews

COLOR

ANIMATED HANGMAN. Color. ©1981 S.S.M., Inc. This outstanding new program will thrill you for hours. He moves, groans and makes sounds. 16K. **\$12.95**

DISASSEMBLER. Color. ©1981 S.S.M., Inc. This program displays hex on left side of screen and ASCII on right side of screen. For screen or printer. 16K. **\$14.95.**

MODEL I

TRS SUPER INVADERS. ©1980 S.S.M., Inc. This is the same as Super Vaders except it is for only one player at a time. MOD I only with mono sound, cassette. **\$19.95.** MOD I with stereo sound, disk only. **\$24.95.**

HYRES. ©1981 by D. Lewandowski. This is a patch program for the programs called: Invaders Plus and TRS Super Invaders; so they can be run on the Programma Graphix-80 board. MOD I, cassette programs only. **\$9.95.**

MODEL III

TAPE COPY 2. New for the TRS MOD III. This program will load most any TRS-80, 500 baud system tape (standard MOD I speed) and load it into memory and save it at 1500 baud on the MOD III. No knowledge of machine language needed. Now it gives you a way to backup programs that load at the slower speed and makes cassette loading into your new MOD III a much faster and more reliable process. MOD III only, cassette. **\$19.95**

SUPER VADERS. (with sound) ©1981 S.S.M., Inc. This is the MOD III version of the popular program called TRS Super Invaders. One of the finest space invader type games written for the TRS-80 machine. Monsters march down the screen and fire as they approach the bottom of the screen. 1 or 2 players. 10 levels of play. Can you stop them? MOD III only. Requires 16K free memory. (please state cassette or disk.) **\$19.95.**

MODEL III/ BOOK

MOD III ROM COMMENTED. For the programmer that needs those answers about the MOD III ROM ... Now! This is a complete list of locations in MOD III ROM and comments on each. All 14K of the ROM. There is no other book out that gives you the detail that this book has. Don't miss it. In order to respect Tandy's copyright the actual disassembled code is not printed, but the book is in a 3 ring binder format so you can put your own listing in between the pages for easy reading. Only **\$22.50.**

POSTMAN DATA HANDLER. By Alger Software. ©1980 S.S.M., Inc. A machine language mailing list program that will do the following: 650 labels on a 35 track disk drive, 750 labels on a 40 track disk drive, 1534 labels on an 80 track disk drive, 10 fields (2 user defined), fast sorts (500 records in 30 seconds), fully usable on one (1) drive system (capacities shown are for a single drive system), most any label stock that is one up can be used (you save no money buying labels that are more than one up anyway), print one label at a time or a sequence of labels, purge duplicates with or without user assistance, 9 digit zip code, super fast search on any field -3 second average, easy screen editing.

Now Postman Data Handler has been upgraded with many new features. Now this very popular mailing package is not just the best way for most people and small businesses to do their mailing lists, but now we give you a way to uncramp, convert, and formletter your mailing list. You need this package if one of the following is true: If your mailing package is memory dependent. This means that you must have more memory to handle more names in your machine; If you need a way to get rid of duplicate names in your mailing list; If you want to sort on more than just name or zip. (our package can sort on any or all 10 fields at once.); If you are waiting more than one minute for your sort to finish. (our package is in all machine language so it runs very fast); If your present program will not handle the 9 digit zip code; If your program doesn't have full screen editing. This package is a machine language program, this is the reason for the super fast speed of all functions!

This is a random access disk based program and any name can be called to read, write, print or update in 3 seconds or less. Now along with it you get utilities that permit you to do the following: CONVERT 1; takes all the files from your old mailing list and converts them to our system. (Why should you change to our system if we made the change hard?) CONVERT 2; convert from our package back to ASCII files if you want to do something with them (like send them to another computer over the phone). MOD I (coming soon for the MOD III). This program runs on all quality operating systems. Requires min. 1 disk drive and 32K memory. only **\$125.00**

POSTWRITER. ©1981 S.S.M., Inc. Now there is, at extra cost, a formletter package that permits inserting any of the 10 fields of information into any part of the letter. (yes even in the body of the letter), and right and left justify the letter. This program is made to be used with only the Postman program and one of the following word processing packages: Lazy Writer or Electric Pencil. ... **\$49.95.**

SPECIAL—If you purchase both Postman and Lazy Writer at the same time, at list price, (or if you already own one of the packages above and now want to purchase the other), we will at no extra cost include the Postwriter package FREE. There are 2 ways to purchase this package. The first way is to say "I want the best package on the market so send me the full system at one time". This includes the Postman Data Handler, Convert 1 and Convert 2. The package works on all quality operating systems based on the Tandy disk format (TRSDOS, VTOS, NEWDOS, NEWDOS-80 etc.) **\$250.00.** This price is only good till June 1, 1981. Save **\$49.95.** If purchased separately. **\$299.95** or:

MINI POSTMAN. Sample Package. For you people who have a small mailing list (max 26 names) and/or you can't believe that Postman is the best package and we must be overstating how this program runs; try our sample package called Mini Postman. It comes as a full up and running program and shows you how good our package really is. This package can be upgraded to the full package within 30 days of purchase by calling and saying "I want the full package", and paying the difference between the mini and the full package. Note: Mini Postman does not include the convert utilities. If not everything you expect, return sample disk for full refund (less shipping). You can't lose. **\$25.00.**

CHAIN MAKER. By Steve Skindell. ©1981. This program makes writing chain files on NEWDOS-80 a breeze. This is not only a program that just creates chain files but it also is an editor of the file. A file can be removed from the disk and edited and saved back to the disk quick and easy. Outstanding program and a must for every NEWDOS-80 owner. Comes with complete easy to read manual. Purchaser must own NEWDOS-80. **\$14.95.**

THE CREATOR. ©1980 C.B.S., Inc. The Creator is a new type of program for the microcomputer operator - yes operator! Easy enough for the person just getting into the market. Use and create a program that is very sophisticated that programmers will comment highly about. The program will create error free basic programming code. Not almost ready to run but ready to run, when you are finished. Yes, gives birth to a program. Just answer simple questions and have a simple background in the disk system of your computer (if you read your basic manual when you have questions you will have no problems). This program is not a data base!

Now in the package comes the report generator that is in the same concept as the Creator. It is called **Reporter.** This program creates report output for the Creator for either screen or printer. This is the most outstanding programming package available from anywhere. Now you can create inventory systems, payables and receivables, check register and expense register, and much more! The system requirements are one of the following: MOD I 32K disk, MOD II 64K disk, Apple II 32K disk. (please state system when ordering). These 2 programs are on one diskette and are available complete for only **\$295.00.**

GRAPHX. By Steve Skindell ©1981. This is a program that is for the person who does reports or requires some sort of plotted output to show gains or losses, or any type of output that needs graphs. This program puts to the screen or to a printer the plotted points in bar graph format and plots the mean, average of plotted input. This is a very important program for accountants, CPA's, or the average businessman to evaluate, at a moments glance, where he is, was, or maybe where he is going. The files save to disk and can be recalled at any time to be re-examined, modified, or just reprinted. An extra feature is: if you have the Microline 80 printer, by Okidata, your output is in true graphics. Information is supplied for the user so he can modify this program for a special printer. Comes complete and ready to run. Requires MOD I or MOD III 48K disk. Printer optional (132 col.) only **\$49.95.**

SPECIAL — Receive this program for only **\$25.00** if you purchase an Okidata Microline 80 or 82 this month from us.

An
innovative
word
processing
system
for
TRS-80*
MOD I



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It is time to put your
word processing program
away and use a
Word Processing System

*Lazy Writer is the product of ABC Sales

LAZY WRITER Takes on Scripsit® by Radio Shack® and Electric Pencil®

Has all the things that other word processing programs should have. Easy to use, written all in machine code. / It permits the inserting and deleting by characters, words, sentences, and paragraphs / Page scrolling up and down / Search ahead of the cursor or behind the cursor for any character / The cursor can be moved up, down, left and right / You can seek top of file and bottom of file / Block move of text, block delete of text / Search and replace or search delete / Unlimited insert (to the limit of your machines memory) / Permits use with lower case /

Has things that other programs should have, but don't. Upper and lower case output to your printer (if your printer accepts lower case) without having your computer modified. ON UPPER CASE ONLY MACHINES: This program marks the capital letters so you can see which letters are CAPITALS and which are not. / Will change all upper characters text to lower case or all lower case to upper, A SINGLE COMMAND / Will capitalize the first letter of all sentences and all proper noun I's, WITH A SINGLE COMMAND / LOADS ANY ELECTRIC PENCIL / FILE, ASCII SAVED FILES, EDTASM FILES or BASIC PROGRAMS SAVED ASCII / Permits installing special control characters in your text for your printers special features, like double wide or condensed print / Definable screen length and definable print length to 255 characters wide / Screen editing that is not final till your command. This means that you can edit your file on the screen and if you don't like how it reads you can cancel and leave it the way it was / You can append files (which means that you can put one file to the end of another file) / No lost characters at the end of the line, even for the fastest typist / A directory of all your files is available to the user without leaving the program / Saving programs to disk easy enough for the non-computer user / To save memory, not all the program modules are in memory at one time but are called from the disk as needed / You can set tab positions like on a typewriter / 10 CUSTOM COMMAND KEYS for the experienced user there is a command file that permits many special functions that are all user defined (not enough space for better explanation in ad, send for complete overview) / Program has HELP file that is a short review of the commands that are available /

Standard Printer Module. This printer module is provided for the user as a standard feature. Optional special printer routines for custom printer will be available in the near future. In this original release, it has the following printer drivers and will support the following printing devices: RS232, TRS232 and PARALLEL printer ports. You have the following format commands: Justifies Text, Centers Text, Centers Title, Line Spacing, Line Length from 3-255 characters and Set Margins / Also send any ASCII code to any printer from the text / Save formatted text to the disk for spooling later / Information for customer to load his own special printer driver / Printing can be stopped and started by the user at any time and then restarted where you left off / You can print entire file or just print to bottom of the page /

Communication Package. RS232 COMMUNICATION TERMINAL PROGRAM permits you to communicate with other computers. Transfer files from one machine to another. Permits dumping memory across the phone lines. Receive files from other TRS-80's and "Shake Hands" with larger computers. This is the complete system called LAZY WRITER. There is no package written for the TRS-80* that is as comprehensive. This package is available for the TRS-80* MOD I, 32K or larger with at least a single disk drive. List price is from

\$125.00

Dealer Inquiries Invited



✓ 434

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problems and special products made for
use with this system.

Modify this package for TRS MOD III

Program to do form letters.

SUPER UTILITY. © 1980 by Kim Watt of Breeze Computing, Inc. Sold on protected media only. **Main program list:** Zap Utility; display sector (disk, file), display memory, compare disk sectors, copy disk sectors, verify disk sectors, zero disk sectors, string search, sector search, single or double density diskettes (if your machine works normally with double density). Purge Utility; kill selected files, get disk directory, zero unused directory entries, zero unused granules, remove system files, kill by category, change name, date, password, auto command, change file parameters, remove passwords. Disk Format Utility; standard format, format without erase, special format, read address marks. Disk Copy Utility; standard copy with format, standard copy without format, special copy (to back up many protected disks) - purchaser use only for his own personal disks. Tape Copy Utility; this program is to make backup of any TRS-80 tape, no matter how it is recorded (note again this program is for the use of the original purchaser for his own programs only). Disk Repair Utility; repair gat table, repair hit table, repair boot, read protect directory track, recover killed files, check directory. Memory Utility; move memory, exchange memory, compare memory, zero memory, test memory, input byte from port, output byte to port, memory to disk, disk to memory. MOD I, protected disk only. **\$49.95.**



QUICK FIX. ©1981 by Kim Watt of Breeze Computing, Inc. The sister program to Super Utility "the Grand Master" of utility programs, does "Master" of utility programs, and has the ability to do all the things that have made Super Utility great, except: it does not have the following features; it doesn't have the Special Copy that backs up most TRS-80 readable protected diskettes, it does not have Tape Copy feature that copies any TRS-80 MOD I readable tapes, the Zap program does not go to double density diskettes, it does not have the Special Format feature.

Main Program List: Quick Zap; display sector (disk, file), display memory, compare disk sectors, copy disk sectors, verify disk sectors, zero disk sectors, string search, sector search, examine address marks. Quick Purge; kill selected files, get disk directory, zero unused directory entries, zero

unused granules, remove unused system files, kill by category, change name, date, password, auto command, change file parameters, remove passwords. Quick Format; standard format, format without erase. Quick Backup; standard copy with format, standard copy without format. Quick Repair; repair gat table, repair hit table, repair boot, read protect directory track, recover killed files, check directory. Quick Memstuff; move memory, exchange memory, compare memory, zero memory, test memory, input byte from port, output byte to port, memory to disk, disk to memory. The one extra feature it has is: you can put Quick Fix on all your diskettes. MOD I. On nonprotected diskette, **\$34.95.**

OTHER THINGS from Kim Watt of Breeze Computing, Inc.:

MAKE 80. ©1980 AM Electronics. Written by Kim Watt. This program is for people who have 80 track disk drives and do not wish to keep that old 40 track drive just to load their 80 track system. Make 80 is loaded into your machine when it is placed in your 0 drive in an 80 track drive and then the reset button is pressed. It loads automatically and asks for 35 or 40 track diskette. When you insert your diskette in the drive the program reformats the diskette so your 80 track disk system can read all of the information from the diskette without having to have a 40 track drive. This program works on standard NEW-DOS, TRSDOS, NEWDOS-80 diskettes. Does not work on any disk that has any funny sectors (VTOS) or with the LOBO interface. 80 track disk only. **\$14.95.**

SPACE COLONY. by Kim Watt. Space Colony is a space invaders type game for TRS 80 MOD I and with Programma Graphix 80 board. One level of play, single player, with sound. MOD I, 16K. **\$14.95.**

CAPTURE/SYMON. By Breeze Computing, Inc. Capture is a 2 person game of Blockade for the MOD I. With sound this game comes alive with fast action. MOD I, 16K. Cassette \$12.95, Disk **\$17.95.**

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Both printers have the ability to do single sheet letterhead, run roll paper, 9½ fan fold paper and has an optional tractor feed for running mailing labels. (Compared to the MX-80 that can't run single sheets or roll paper.) This makes these 2 printers an outstanding buy. But if you want an MX-80 or MX-70 call for a price.

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*TRS-80 is a product of Radio Shack, division of the Tandy Corporation.

The figures show educational computing materials to be a more than substantial market. However, success in this market is not guaranteed. Other factors hamper an all-out investment among publishers.

One factor that makes the market so unstable is that both publishers and educators are unsure as to where the funding will come from for technological materials. Lloyd Prentice, publisher and editor of *Classroom Computer News*, said that the education market is a huge market that has become decentralized because of severe economic pressure. Prentice said that it is hard to determine what this means; will it reduce the buying tendency or increase it? No one is sure, and many publishers that were surveyed expressed the same concern. Bowen said, "When you look at the technology, there's some exciting things and great potential. . . but there is a money problem in education. With enrollments down, inflation, the cost of energy and all the other economic factors effecting school budgets, it becomes hard to perceive where all this money is going to come from for the materials. I think this is the great reservation we all feel right now."

Bowen also questioned whether educators would be able to justify the expense of the materials. "In business where a new technology can improve productivity, obviously then, it can be justified as an additional expenditure, however, this is not the case in education."

Perfection Is Essential

Creating good educational software also has its problems. Perfection is essential for traditional publishers because, first, long-standing reputations are at stake. Secondly, how and what we teach our children will be somewhat changed by computerized instruction. Publishers cannot afford to have a program crash, especially after months of expensive research spent creating the program.

A company spokesperson for CBS said, "Any time your program doesn't work, then every publication you have will be called into question." Most educators will not accept anything less than high quality programs. Publishers know this, consequently, the objective of creating high quality programs for the classroom automatically becomes more difficult.

Such quality software will have a direct relation to market growth, according to Charles Phillips, senior vice president in charge of special markets for Tandy Corp. "The market will grow in proportion to the quality of instructional material available. That's why publishers are spending a lot of time and money on it."

Bowen said McGraw-Hill has been investigating the area for 18 months. Three types of programs concern them: management, computer literacy and computer assisted instruction.

McGraw-Hill will aim its packages toward the elementary through two-year college market, including technical instructions. They plan to start test-marketing their courseware at those levels sometime this year.

Most of the packages will not be specifically designed for use on a single microcomputer. Again Bowen stressed McGraw-Hill's commitment to producing a variety of software to meet the needs of different schools.

"Right now we know that there are actually more micros at the secondary and post secondary level than there are at the elementary level. That doesn't mean that two years from now that will be the case; consequently, we will look to see what the interest is on a variety of levels," said Bowen.

McGraw-Hill has developed four prototypes and presented them to focus groups—educators, community leaders and school administrators—in five regions of the country.

The first is a management system which demonstrates how the micro and related components can be used by teachers and administrators. It records a student's progress, diagnoses particular problems a student may be having and provides teachers with a rundown of a student's level of competency in the curriculum.

Another prototype develops learning concepts and includes an audio component giving a student verbal feedback from the computer. The third is a drill and practice package, and the fourth is a simulated application in which the student has to apply a skill or concept that he has learned.

The focus groups were asked about the packages' appropriateness, and their need for them; would they be interested in purchasing such packages, if they were on the market? Were the programs a good value?

Currently, McGraw-Hill is working with outside contractors who are creating and producing their educational software, but have not eliminated the possibility of developing it in house.

A spokesperson for CBS Educational and Professional Publishing Division said that they, too, are preparing for the advent of computerized instruction. However, they have finalized no plans as of yet for two reasons. First, said our source, there are only a few microcomputers on the market that have the durability to be used

in a school environment. And secondly, the schools are not computer literate except for one state. (Minnesota has had a state run computer consortium for over a decade.)

The spokesperson said, "Other than that, most states and most school districts are only computer literate in the sense that they bought a microcomputer and it's sitting somewhere in the school system."

CBS will primarily focus on the elementary school level because they feel it is the greatest market base. Their programs concentrate mainly on reading skills.

CBS has been researching the area since 1979 and has developed prototypes that are designed for use on the TRS-80. They include a spelling program, spelling test and vocabulary builder, a grammar program and text editing program. In order to test these prototypes, CBS provides a TRS-80 for a classroom over a period of eight to 15 weeks. Later, they test children to determine if they are learning effectively with the aid of a computer. This method of testing is expensive and time consuming; however, one major concern of CBS, said the spokesperson, is whether the use of a computer really does help a child to learn.

"There is such a rush for products now that the quality and what is good for the children has not been explored," he said.

"It doesn't take very long to develop a good program," he continued, "the question is: Is there a market for it? We're not sure how long it's going to take. Secondly, the program has to be validated so it doesn't crash. . . these publishers can't just publish programs and hope they work 99 percent of the time—they must work 100 percent of the time. We know from past experience, you can't afford to publish bad products."

Courseware Catalog

Random House is extremely interested in the education market. So interested, that they just released a microcomputer courseware catalog that includes 28 programs.

The programs (K through 12th level) cover the subjects of mathematics, reading, language arts and management—all of which will be available by the end of the year.

According to George Rosato, vice president and general manager of the school division, the products were created in-house with Random House funds to their specifications. At present, they are available for the TRS-80 (Models I and II) and the Apple II. "We are prepared to adapt them to other microcomputers as the market indicates, but presently we think

these two brands have the necessary capabilities," he said.

Rosato said that he had been studying the education market for two and half years. He decided, after visiting a number of manufacturers, that the TRS-80 had the most features and functions. The next step was to enter into discussions with Tandy and come to an agreement on distribution.

Science Research Associates (SRA), a wholly owned subsidiary of IBM, is also getting into the educational software market, emphasizing computer literacy programs.

SRA had designed courseware in three areas thus far: math, reading and computer literacy.

Their math program is broken down for grades one through three, four through eight, and a mathematics drill program for grades one through six. This latter program automatically measures a student's current performance and moves him ahead or backward as appropriate.

Fact Track is an SRA timed drill application of addition, subtraction, multiplication and division for grades one and above, which is supposed to build speed and accuracy in the four areas. They also offer a set of six arithmetic games for one or two elementary school players.

SRA's reading courseware in an instruction and practice program in the major phonic elements for grades one through three.

Their computer literacy package is a program to introduce students in grades six through twelve to basic computer concepts.

SRA also offers a package entitled the Computer Discovery Program on three learning levels: elementary, high school, and the college adult education level.

The student workbooks accompanying two disks are written on two levels, one at the sixth grade level and the other at the ninth grade level. The workbooks are broken down into four chapters. Chapter one describes important turning points in the history of the field of computer science; chapter two, Analysis and Programming, introduces you to programming techniques; chapter three, Computer Concepts, discusses computer hardware and software along with familiarizing students with binary numbers; and chapter four, Impacts and Applications, discusses the social and economic impacts of the computer.

SRA's educational courseware, as of this date, is available only under a license agreement. Customers must pay a licensing fee and abide by SRA's contract stipulations. They use a license agreement rather than direct sales because "it pro-

vides extra assurance of material security," said Glen Phillips, product development administrator. The license fee is equivalent to the price of the software, which may be kept as long as agreement is abided by.

Their courseware is designed for use on the Apple II or the Atari computer. *Computer Retailing* reported in December 1980 that an agreement between SRA and Atari enables SRA to market Atari's line of microcomputers to the domestic educational market. SRA, in exchange, writes courseware for Atari to sell through its regular distribution channels.

Although SRA has a technical staff that has been creating the software in house, Phillips said one of the major problems is finding authors to write good educational software.

Phillips also expressed his uncertainty of the education market. "No one has any kind of idea as to how many dollars are going to be spent on software. There is no statistical information on this subject simply because commercial publishers, like ourselves, have not been selling software long enough for there to be any kind of statistical analysis. It's a very high risk."

Scott, Foresman and Co., another traditional textbook publisher, set up an electronic publishing division last November. Thus far, they have introduced a courseware series in reading skills for grades one through three (all of which will be available before Sept. 1981) and a mathematics courseware series for grades one through eight which will be available by the end of April.

They have also developed a school management program made up of 14 packages that handle administrative duties, scheduled for release this summer.

The packages are designed to run on the Texas Instruments 99 microcomputer (TI 99). Foresman has a nonexclusive agreement with TI; the programs can be purchased separately or as a package with the TI 99.

Dale La Frenz, manager of the electronic publishing division, said that they are using their own technical people including subject matter experts and instructional design people to develop their software. Also, they, like other publishers, receive a large amount of unsolicited material from people interested in publishing for the education market.

The Dolphin

Houghton Mifflin has made the most bold advance into educational courseware. They have swallowed Time Share Corp. (TSC), a software publisher. Stride,

developed in 1979 by TSC, includes a math program for grades one to eight and a reading program for grades four to six. The programs are designed to be used either as drill and reinforcement exercises or as remediation exercises by the teacher. Stride also provides a management routine that classifies a student's progress.

Houghton has also recently come out with an algebra program for grades eight to 10, an individualized computation skills program for grades seven to 12 and three books; one an introductory book, one on programming and a computer resource book for algebra students.

Originally, Stride was designed for TSC's own hardware system, the TSC 200/300. Though the software for Stride was recently adapted for use on their first microcomputer, the Dolphin, it is still available for the TSC 200/300.

Robert Yo, Sr. Vice President of TSC, said that the Dolphin, introduced last January was specifically designed for classroom use. Among its features are provisions for eight terminals and a memory of 20 million characters. In essence, it has the power of a minicomputer but is small and compact. Yo said that any software that Houghton creates in the future will be adaptable to the Dolphin.

Houghton Mifflin also distributes a hardware-software system called The Answer, an instructional support system for teachers. TSC developed the software for The Answer and the hardware was purchased from Basic Four. The Answer is capable of a number of duties; it scores tests, diagnoses skill weaknesses for an individual student, shows class progress, indicates how much a class has learned toward each objective of a test, and also handles basic clerical duties.

TSC also produces a package for use in guidance offices which lists higher education institutions and career opportunities under a number of categories. Originally designed for the large mainframes, TSC has recently adapted it for use on their micro.

Addison Wesley, another well-known textbook publisher, also has an interest in the software market. They have a number of math packages that are planned for marketing next fall. They include: high school algebra and analysis, and junior high school and upper elementary arithmetic. Originally written in Apple BASIC, they will also be available for the TRS-80 and Commodore PET.

Basically, Addison Wesley is still researching the area, and was unwilling to comment specifically on what direction they will take. Carl Hesler, general manager of the business and professional division (a part of the higher education

division) said, "because we've been in the computer science area since the mid-60s we know that the market is there and is reasonably large. More of our activity is centered around asking various questions about the direction of the market."

Hayden Book Co. is perhaps the most involved of all of the publishers contacted. They have been serving the general computer market for the past ten years. Consequently, the people at Hayden are feeling secure.

Currently they only market two software packages that are aimed at the elementary and secondary school level—Crossbow, which familiarizes children with fractions, and Programming in Apple Integer BASIC.

Hayden's market objective is to publish software for the computer hobbyist. However, they do plan to direct more of their material to the educational market, said Karen Nelson, chief editor of the computer science division. For example, a book called *I Speak BASIC* is directed to the high school level and will be used initially with the TRS-80 and then the Apple.

Nelson expressed many of the same sentiments as other publishers about the education market. It is difficult to get good education programs, Nelson said "People either know how to teach or they know how to program; it's very difficult to get the right combination. Many of the people who are trying to write educational software are not really making use of what the machines can do. Many of the programs we see... look like book pages on the screen and in many cases they aren't much more than that."

Some Groundless Fears

Perhaps an unspoken concern of many educators is the fear of being replaced by a computer. And there has been much comment directed towards the teacher who has a micro in his classroom and doesn't know how to use it, or feels threatened by it.

Of the publishers surveyed, most see the micro as a tool to help the teacher. Firstly, computers can perform clerical duties that consume a large percentage of a teacher's time. And secondly, the computer's daily reports on students' performance can leave more time for individual teacher-student interaction.

Bowen of McGraw-Hill doesn't think that the textbook will ever be replaced. He sees the microcomputer as a tool rather than something that will supplant traditional education methods. "For instance," said Bowen, "we know that textbooks work very well for a large body of students. We also know that some students need additional assistance or need

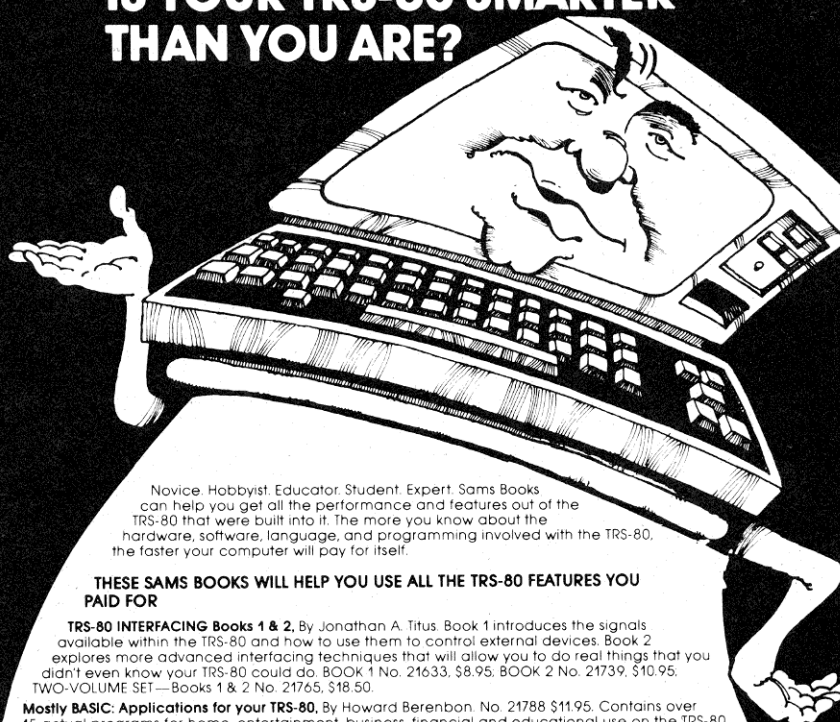
more challenge. This technology can be used to better identify those students and gear teachers toward more individualized instruction."

The spokesperson for CBS was quick to stress that the computer can't teach something that the student doesn't already know; it can only reinforce. He went on to say that there hasn't been much change in classroom techniques since the 1800s. "People keep forgetting that the chief goal in going to school is learning how to get along with people and to learn

something about the world around you—hopefully reading, how to count and something about being a good citizen. Of course the rest is important, but has never been ranked as do or die."

Rosato of Random House thinks that the micro will become as common as the typewriter. However, "much of its significance," said Rosato, "depends on good publishing, that is, designing good programs and marketing them effectively. It depends on what we will allow educational software to do." ■

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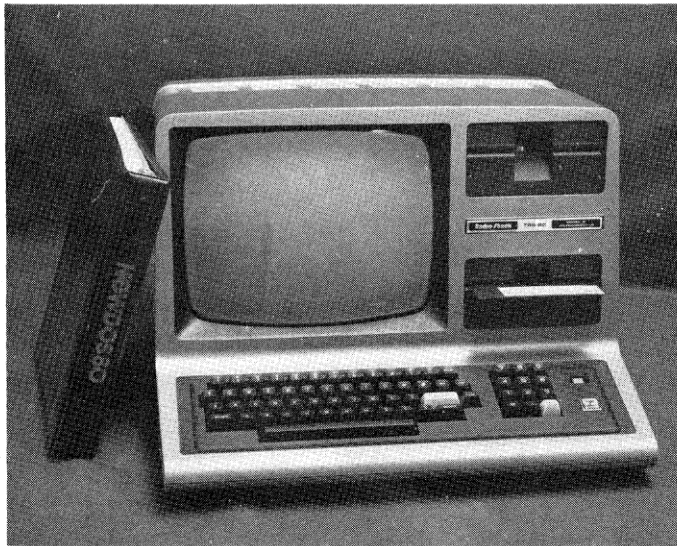
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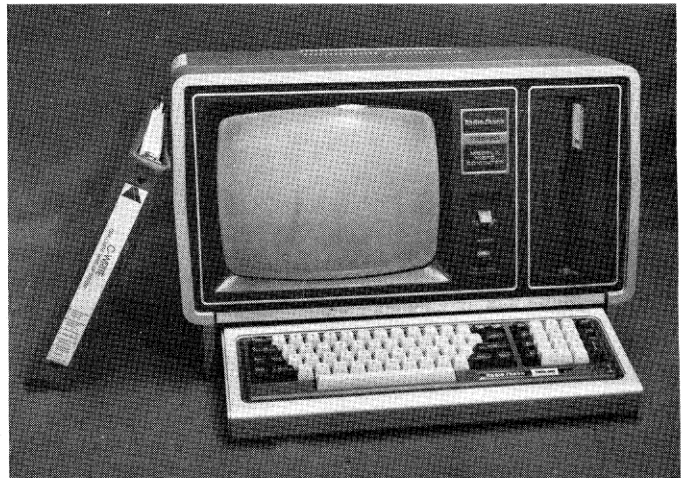
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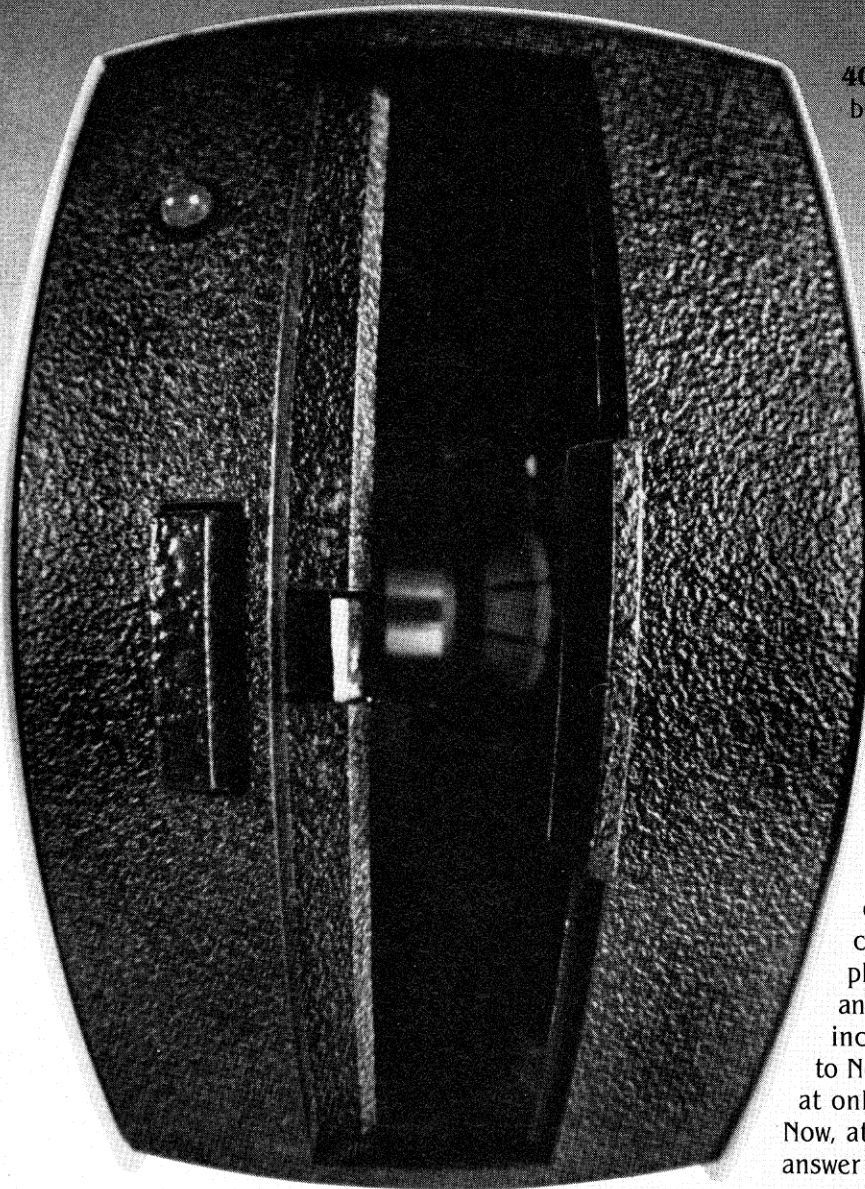
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APPARAT INTRODUCES

Now even more bytes per buck



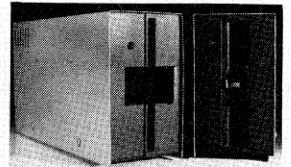
405 K/bytes of storage. Apparat has combined its Newdos/80 operating system and a dual-sided 80 track mini-floppy drive to give you 405,000 bytes of storage in a single volume. Modification patches to Newdos/80 expands the capability of single density drives, so you'll have greater applications for your TRS-80 model 1.[®]

Drives plug directly into an expansion interface with no modification required so you can now have over 1 megabyte of storage on-line with standard mini-floppy diskettes. Each drive has 316 free grants, for a total of 948, on a maximum of three 80 track drives, which can be added to a TRS-80.

Upgrading to double density is possible by running under most double density controllers, (e.g. Percom's Doubler).

These drives can "read" standard 35 or 40 track diskettes with special software that skips every other track.

Drives come complete with case, power supply, interface cable and documentation including patches



to Newdos/80. The drive mechanism is priced at only \$699 (Cat. No. 1-705, specify I or III). Now, at 579 bytes per buck, it just might be the answer to your storage problems.



Apparat, Inc.

4401 So. Tamarac Parkway, Denver, CO 80237 (303) 741-1778



Now available for model III, 728K bytes of storage.

DISK DRIVES

- The TANDON TM 100 5¼ INCH FLOPPY DISK DRIVE is the drive mechanism used by Radio Shack in the TRS-80 model I and III computers. The patented double sided read/write head is the acknowledged industry standard, being used in more mini-floppy drives than any recording head. The TM 100 has field-proven dependability with over 200,000 drives performing with unparalleled read/write reliability and data integrity. Apparatus is pleased to offer these drives with power supply and chassis, fully checked out on the TRS-80 Models I and III.

MODEL I DISK DRIVES

with power supply and chassis:

40 TRACK

| | |
|----------------------|----------|
| Tandon single sided | |
| Cat# 1-702..... | \$339.00 |
| Shugart single sided | |
| Cat# 1-701..... | \$339.00 |
| Tandon double sided | |
| Cat# 1-703..... | \$499.00 |

80 TRACK

| | |
|---------------------|----------|
| Tandon single sided | |
| Cat# 1-704..... | \$549.00 |
| Tandon double sided | |
| Cat# 1-705..... | \$699.00 |

| | |
|--------------------------|---------|
| Two drive standard cable | |
| Cat# 1-714..... | \$29.95 |

| | |
|---------------------------|---------|
| Four drive standard cable | |
| Cat# 1-715..... | \$39.95 |
| Extender Cable | |
| Cat# 1-744..... | \$16.95 |

MODEL III DISK DRIVES

with external power supply, chassis and controller:

40 TRACK

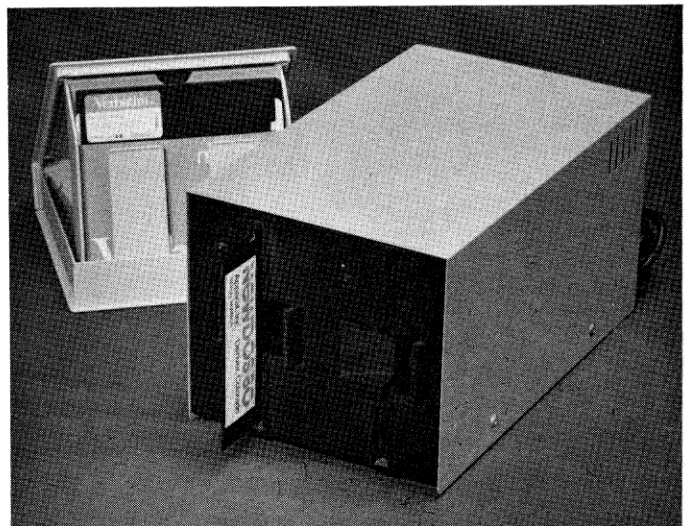
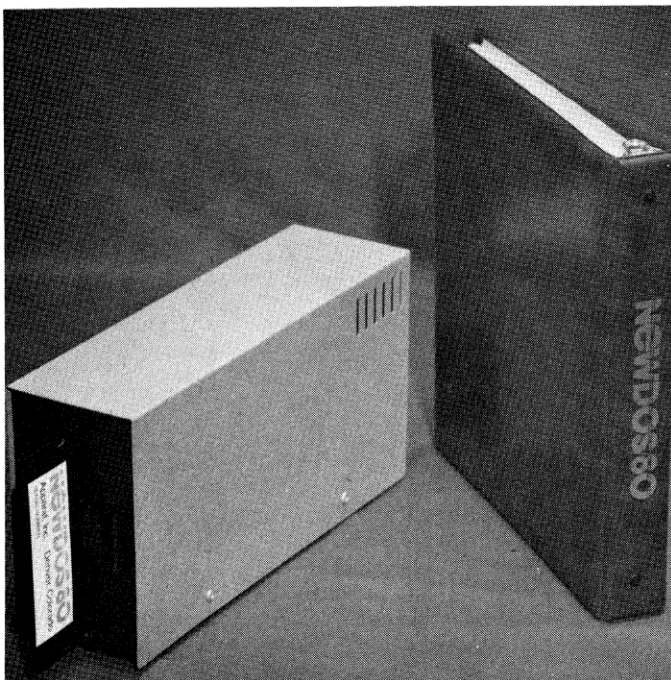
| | |
|----------------------|----------|
| Tandon single sided | |
| Cat# 1-732..... | \$699.00 |
| Shugart single sided | |
| Cat# 1-733..... | \$699.00 |
| Tandon double sided | |
| Cat# 1-734..... | \$759.00 |

80 TRACK

| | |
|---------------------|----------|
| Tandon single sided | |
| Cat# 1-735..... | \$849.00 |
| Tandon double sided | |
| Cat# 1-736..... | \$949.00 |

Drive is mounted in a dual drive cabinet. Includes drive cable.

| | |
|---|--------------------|
| Optional four drive cabinet with power supply | |
| Cat# 1-730..... | Additional \$59.00 |



DISK DRIVES

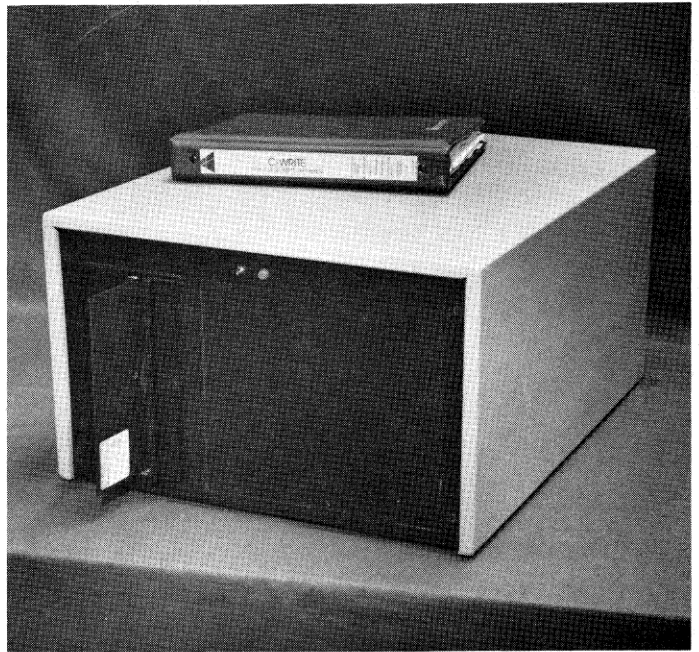
Additional drives without chassis or power supply:

| | |
|------------------------------|----------|
| Tandon single sided 40 Track | |
| Cat# 1-737 | \$259.00 |
| Shugart single 40 Track | |
| Cat# 1-738 | \$259.00 |
| Tandon dual 40 Track | |
| Cat# 1-739 | \$379.00 |
| Tandon single 80 Track | |
| Cat# 1-740 | \$399.00 |
| Tandon dual 80 Track | |
| Cat# 1-741 | \$499.00 |

Internal disk drive kit. Includes chassis, controller, mounting hardware and cables.

| | |
|------------------|----------|
| Cat# 1-731 | \$449.00 |
|------------------|----------|

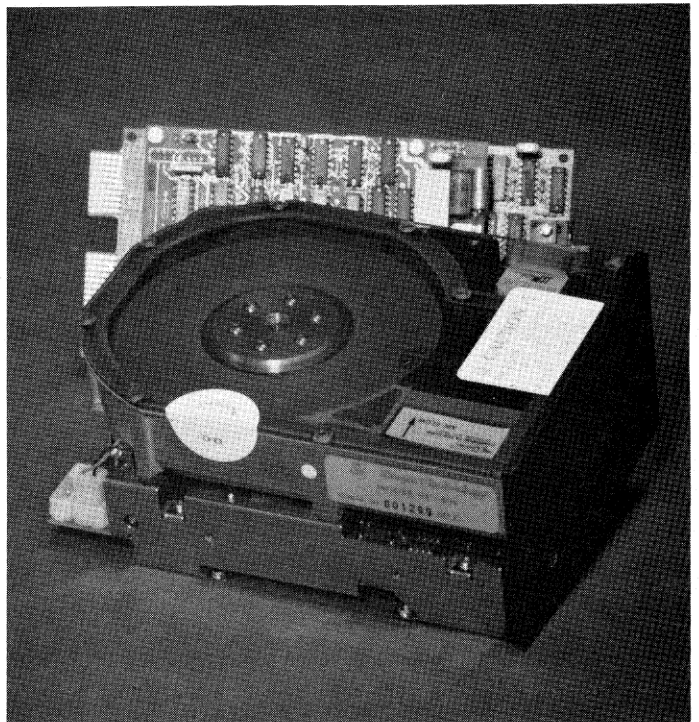
(Does not include disk drives. Select drives of your choice from those above.)



- **SINGLE DRIVE EXPANSION/TRIPLE CABINET** - The Model II's attractive Shugart SA801 drive housed in a triple drive cabinet. (May also be used in a Model I 8" floppy disk) Self-contained power supply and cabling accommodates expansion to full complement of drives.
Cat# 1-725..... \$1095.00
- **DOUBLE DRIVE EXPANSION/TRIPLE CABINET** Same as above with two Shugart eight inch drives.
Cat# 1-726..... \$1545.00
- **TRIPLE DRIVE EXPANSION/TRIPLE CABINET** - Same as above with three Shugart eight inch drives.
Cat# 1-727..... \$1995.00
- **ADDITIONAL DRIVES for the EXPANSION/TRIPLE CABINET.** Power supply, cabling, case not included.
Cat# 1-728..... \$479.00

WINCHESTER DISK DRIVES

- **HARD DISK EXPANSION SYSTEM - CAMEO 10** megabyte fixed/removable hard disk expansion system for the Model II. Includes hard disk, hardware interfacing, cabinet, and modifications for TRSDOS
Cat# 1-729..... \$6800.00
- Watch for our 5¼ Winchester Disk System with Controller, available in Spring/Summer 1981. Optional tape or floppy disk back-up.



PRINTERS

EPSON

(Free Cable with every Printer - Specify Computer Type)

MX-80

- The EPSON MX-80 is not only one of the least expensive of the parallel printers available from APPARAT, it is one of the most powerful! Compare the MX-80's features with other printers around and you won't find another printer that offers so much for so little! The MX-80 has a 50 million character life print head and can be replaced by the user for less than \$30.00. It prints 96 ASCII, 64 TRS-80 graphic, and 8 international characters in a crisp 9X9 matrix which provides lower case descenders. The user can software select 40, 80, 66, or 132 column character sizes and the printer puts them on paper at a fast 80 CPS bidirectionally with logic seeking! The MX-80's built in tractor feed mechanism will adjust from mailing label size up to 10" wide paper. All of that plus front panel line and form feed control and a built in self-test mode. A new option soon to be available is an upgrade allowing high resolution dot matrix graphics!! Hard to believe that a

printer that offers so much for so little is available! It is at APPARAT for only:

Cat# 1-403 \$645.00

MX-70

- If the low price of the MX-80 is still over your budget, try the new MX-70. Many of the same features of the MX-80 such as 64 TRS-80 graphics blocks and dot matrix graphics are still offered but it prints a 5X7 matrix character at 80 CPS unidirectionally. EPSON removed the front panel line and form feed switches and lowered the price even more!! Available from APPARAT for only:

Cat#1-416 \$449.00

- Watch for the announcement of a new "full size" printer from EPSON in the late spring. It will have all the features of the MX-80 but will accept up to 15" wide paper!! Price expected to be under: \$1000.00

ANADEx

DP-9500/DP-9501

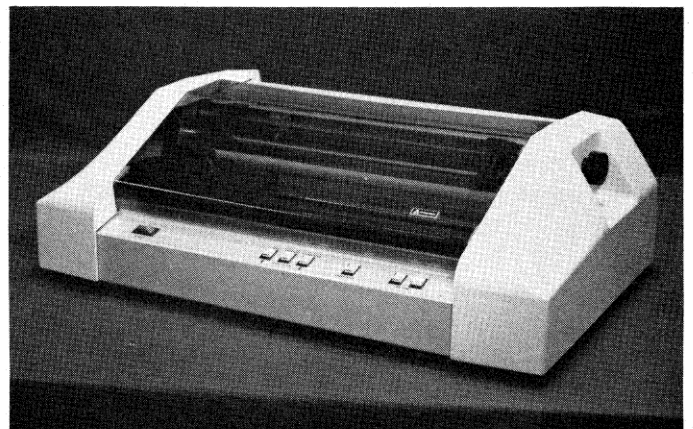
- The DP-9500 and DP-9501 printers offer 132/158/176 and 132/165/198/220 column printing, respectively, featuring the full standard ASCII 96 character set as well as high-resolution graphics. The 650 million character life print head zips across the paper at a rate up to 200 CPS and the printer offers a standard 600 character FIFO buffer with an additional 2K plug in buffer option available. The three ASCII compatible interfaces (parallel, RS-232-C, and 20 ma current loop) are standard providing fully software controllable features such as: 1.)6 or 8 lines per inch vertical spacing; 2.)Form length and width; 3.)Skip-over-perforation; 4.)Auto line feed (on/off); 5.)Vertical and horizontal tabs; 6.)Underlining; 7.)Character size; and much much more. Tractor feed is adjustable from 1.75 to 15.6 inches. Featuring front panel control of line and form feed, top-of-form setting, and a self-test feature that prints out a complete status of all selectable functions. All of this and more, available from APPARAT for only:

DP 9500

Cat#1-400 \$1399.00

DP 9501

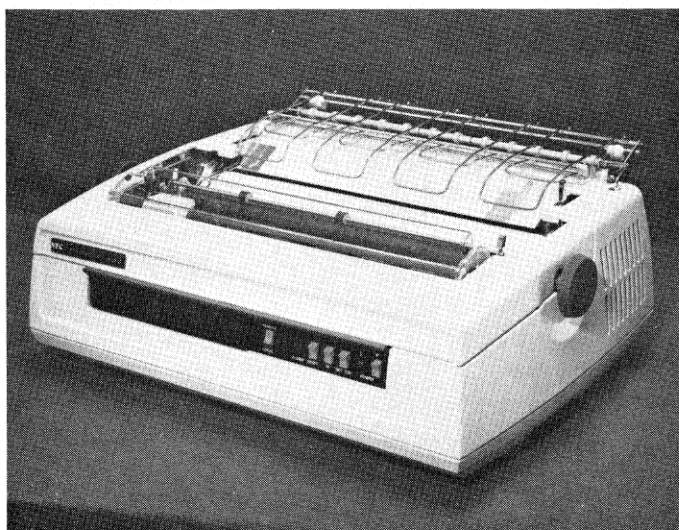
Cat# 1-401..... \$1399.00



NEC SPINWRITER

- For the person looking for a high quality word processing printer, APPARAT offers the perfect solution - the NEC Spinwriter! The Spinwriter is available as a serial (Model 5510) or parallel (Model 5530) printer that prints at up to 55 CPS. The Spinwriter's unique light-weight printing "thimble" is made of fiberglass reinforced plastic consisting of 64 cylindrically arranged fingers. There are over 30 easily changeable thimbles available as well as an all black multi-strike film ribbon. If you are looking for the best in word processing printers, look no further. Available at APPARAT for only:

Cat# 1-405..... \$2549.00

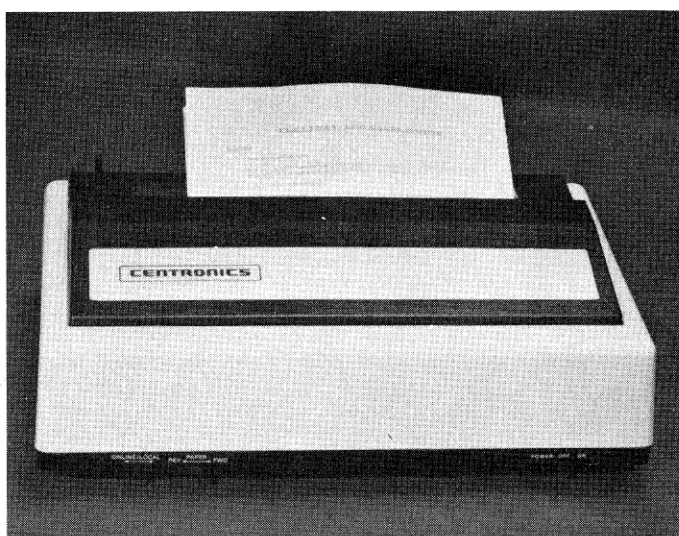


CENTRONICS

737-1

- Why not get the "Line Printer IV" at an APPARAT price? The 737-1's 7X9 dot matrix produces a quality print at a much lower price that approaches the quality provided by an impact printer. This parallel printer offers up to 80 CPS with four character sizes including underlining and bidirectional line feed control. The 737 offers friction feed or 9½" pin feed paper handling. The right margin justification mode allows near typeset quality at a low cost. See the FLEXTEXT ad for a sample print example. This highly popular printer is available from APPARAT for only:

Cat# 1-402..... \$839.00



OKIDATA

MICROLINE 80

- Okidata's MICROLINE 80 offers a quality 9X7 dot matrix head that is warranted for 200 million characters. It prints the full ASCII 96 character set and the full TRS-80 64 character graphics set at 80 CPS. The MICROLINE 80 offers software controllable features such as 6 or 8 lines per inch as well as four character sizes. Paper can be either friction fed or pin fed and an optional tractor feed is available. It comes standard with a parallel port but an optional serial RS232 interface is available. The Microline 80 is available for only:

Cat# 1-404..... \$525.00

Tractor feed option

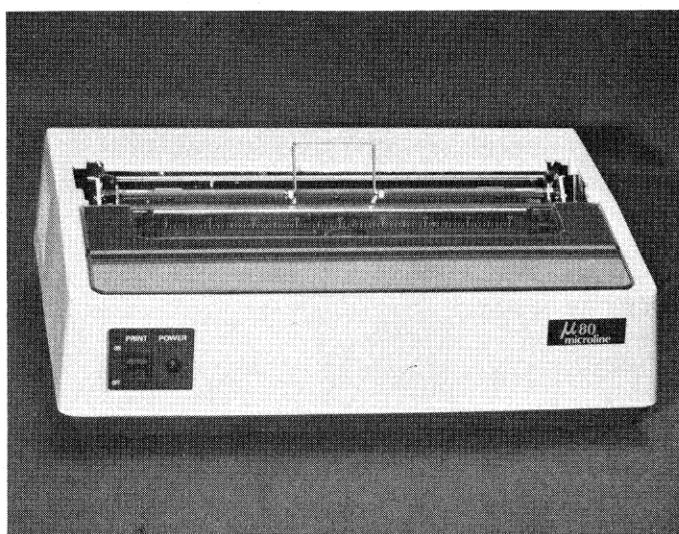
Cat# 1-408..... \$130.00

MICROLINE Model 82 adds bidirectional printing capabilities to the Model 80

Cat# 1-417..... \$699.00

MICROLINE Model 83 has 120 CPS bidirectional printing, 15 inch wide carriage and includes tractor feed.

Cat# 1-418..... \$1049.00



APPLE ADD-ON HARDWARE/SOFTWARE

APPARAT 40X2DISK DRIVE

- The APPARAT 40X2 DISK DRIVE is uniquely designed to deliver more than twice the storage capacity (205K) of a standard Apple disk drive while remaining compatible with the Apple II. At the hardware level by simply plugging into the standard Apple disk controller card. At the software level any Apple software will operate the Apparat 40X2 in exactly the same manner. At the media level any disk written on an Apple drive can be read by the Apparat 40X2 and vice-versa. Therefore, DOS, PASCAL, FORTRAN, Z80 soft-card, Visi-calc, etc., are applicable instantaneously. The Apparat 40X2 has its own integral power supply, reducing power drain and heat buildup -- two factors which seriously affect Apple's

performance. It has a double headed drive with 40 tracks per diskette side, the first 35 tracks corresponding to Apple's standard tracks. In order to use these extra tracks and the other side of the disk, special firmware is required, developed by Apparat, for use with Apple DOS 3.3. Firmware for use with DOS 3.2 and PASCAL is optional.

Cat#: 1-724 \$675.00

* Also available:

40 track single sided (102K)

Cat# 1-742 \$499.00

80 track double sided (410K)

Cat# 1-743 \$839.00

LANGUAGE SYSTEM

- This package includes the Language Card, which allows apple users to take immediate advantage of the powerful Pascal Language as well as the Integer and Applesoft BASIC interpreters. The Language Card's 16K bytes of RAM memory electrically replaces the ROM firmware built into each Apple. Upon start-up, the RAM memory is automatically loaded from disk with the user's choice of language, then electrically protected from change. Includes diskettes containing a language selection "Hello" program, Pascal, Applesoft BASIC, and all reference manuals.

Cat# 1-203 \$495.00

APPLESOFT FIRMWARE CARD

The Applesoft Firmware Card provides access to the library of programs written in the extended BASIC language. It contains hardware and software controls to allow it to electrically replace the existing Integer BASIC firmware in Apple II computers.

Cat# 1-205 \$200.00

INTEGER BASIC FIRMWARE CARD

This card provides access to a library of programs written in the Integer BASIC language. It contains hardware and software controls to allow it to electrically replace the existing Applesoft BASIC firmware in Apple II Plus computers.

Cat# 1-204 \$200.00

PROGRAMMERS AID #1

- Apple developed this set of ROM-based program routines to make it even easier for you to program in integer BASIC. The Programmer's Aid #1 includes Renumbering, Merging, Tape Verification, Memory Test, Musical Note Generation, and High-Resolution Graphics routines. An added bonus is the ability to relocate 6502 machine-language programs. This ROM is available for the original Apple II only. Apple II Plus owners must purchase the new Integer BASIC Firmware Card which includes the Programmer's Aid #1.

Cat# 1-277 \$50.00

DOS 3.3 TOOL KIT

- Includes the Applesoft Tool Kit and the Assembler/Editor to help utilize the full capabilities of the Apple II. This Kit is intended for the Experienced DOS 3.3 user (will not work on DOS 3.2). Also has the Hi-Res Character Generator, the Relocating Loader, and three demonstration programs.

Cat# 2-411 \$75.00

CENTRONICS PARALLEL INTERFACE

- The Centronics Parallel Interface Card includes cable and connector. Will interface with almost any printer that uses the Centronics parallel interface.

Cat# 1-207 \$225.00

PARALLEL PRINTER INTERFACE

- Designed to be used with printers that have parallel interfaces, it can also be used as a general 8-bit parallel output port. Selection from 40 to 255 column output and simultaneous output to printer and screen.

Cat# 1-206 \$180.00

COMMUNICATIONS INTERFACE

- Allows the Apple to be connected to a modem for use as a terminal in either full or half-duplex modes at either 110 or 300 baud. A perfect mate for the Novation CAT modem, the Com Card allows you to transfer programs over the phone.

Cat# 1-224 \$225.00

RS232 SERIAL INTERFACE

- Designed specifically for high-speed printers, though it can also be used for half-duplex communications at rates from 75 to 19,200 baud. It can automatically add a line feed to a carriage return or a carriage return delay to aid in interfacing almost any printer with serial interface. Input for the Apple II can be taken either from an external device, or from the Apple's keyboard, or from both simultaneously.

Cat# 1-223 \$39.95

WIREWRAP PROTOTYPING INTERFACE CARD

- Construct your own custom-designed interface circuits to plug into the Apple II bus.

Cat# 1-225 \$39.95

MICROSOFT RAM CARD

- Add 16K RAM to your Apple II with the addition of this card. Used in conjunction with the Microsoft Softcard, this card allows usage of 56K CP/M. Also allows loading of Integer BASIC from standard DOS 3.3 System Master, just as if there was a Language Card.

Cat# 1-218 \$195.00

MICROSOFT SOFTCARD

- Add the capabilities of running Z80 Microprocessor programs on your Apple. Includes CP/M 2.2 and Microsoft BASIC 5.0 which meets the ANSI qualifications for BASIC. CP/M is the most widely supported operating system available for personal computers. With the addition of the softcard, CP/M application programs can easily be run on the Apple.

Cat# 1-217 \$349.00

VERSAWRITER DRAWING TABLET

- VersaWriter is an inexpensive alternative to the Apple Graphics Tablet that allows for creation of full-color, high resolution graphic images. Images may be stored on disk, rotated, shrunk, enlarged, or even imbedded in programs. Includes two diskettes containing plotting and applications software. Requires at least 32K.

Cat# 1-226 \$252.00

LEEDEX MONITORS

- Three different 12" B/W monitors and a Color monitor that are designed for professionals and priced for the hobbyist. These highly reliable monitors feature a 12 MHz bandwidth for an 80 X 24 line display capability. The solid state circuitry assures a sharp, stable, and trouble free picture.

VIDEO 100: Sturdy, lightweight plastic cabinet

Cat# 1-609 \$169.00

VIDEO 100-6: Same as the 100 but Green Phosphor

Cat# 1-610 \$189.00

VIDEO 100-80: Rugged metal cabinet with mounting capability for a floppy disk drive and space for an 11" X 14" PC board for custom designed electronics.

Cat# 1-611 \$199.00

COLOR MONITOR: 13" High Resolution Solid State monitor

Cat# 1-612 \$399.00

SUP R MOD II

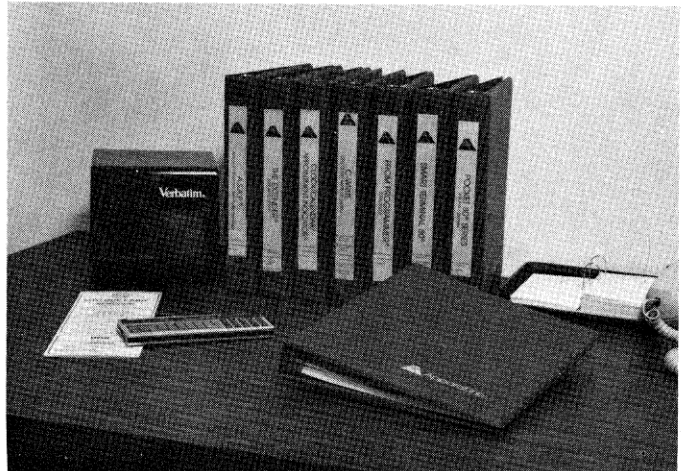
- The Sup R Mod II TV Interface plugs directly into your Apple II or Apple II Plus and allows you to use a standard color or B/W TV for your display. Operating on UHF channel 33, the package includes a coaxial cable and antenna transformer to insure safe isolation with a standard home TV set. Requires assembly

Cat# 1-208 \$29.95

BLUEBOOK SERIES

QUALITY

That elusive essence of professionalism which takes years to acquire has been captured once again by APPARAT's quest for excellence in an innovative series called BLUEBOOK. Reasonably priced hardware and software packages including advanced word processing, intelligent software packages and professional accounting systems (to illustrate just the tip of the iceberg) proudly stand beside NEWDOS/80 and APEX as powerful tools for TRS-80, APPLE, CP/M and MP/M systems. APPARAT is QUALITY. And we're proving it everyday with products presented in the BLUEBOOK series.



- **TRS-80 BUS EXTENDER** provides six slots supporting cards up to 3×5 inches. Can be connected to the TRS-80 Models I and III, enabling optional hardware additions. Connectors, 5 and 12 volt power supply, and an attractive metal case are provided. Specify Model I or III for appropriate cables. (NOTE: Most APPARAT hardware add ons for the TRS-80 can be plugged into the Bus Extender).
TRS-80
Cat# 1-025 \$169.00
- **DATA SEPARATOR** eliminates disk data errors which can occur on the TRS-80 Model I, especially in the densely packed inner tracks. One reason for these errors is the inability of an internal circuit in the FD1771 disk controller chip to function properly under some circumstances. APPARAT'S DATA SEPARATOR simply plugs into the expansion interface and solves the problem. No modifications are required to your Model I hardware or software.
TRS-80
Cat# 1-027 \$29.95
- **PROM BLASTER** programs 25XX and 27XX parts in the 1 to 4K range as well as single (5V) and multi-voltage types by using a 16 pin jumper which configures the programmer to the appropriate PROM type. A zero insertion force socket is provided for the PROM. Utility routines are provided for each PROM type to read, write and verify from/to any range of memory. Only a portion of a PROM may be written enabling programming even if it is not blank.
TRS-80
Cat# 1-022 \$149.00
Apple
Cat# 1-220 \$149.00
- **CLOCK CALENDAR/APPOINTMENT SCHEDULE** provides clock/calendar functions of hr/min/sec in a 12 hr format (AM or PM) and mo/day/yr/day of week, with (and here's the difference!) user's choice of two output modes, program requesting time/date, or time/date can be DMAed and automatically displayed. ALSO includes capability of setting approximately 100 time/dates which cause an interrupt upon matching time/date of the clock/calendar. A BASIC program can maintain an appointment schedule for one or more people, or alert persons to perform certain tasks.
TRS-80
Cat# 1-021 \$169.00
Apple
Cat# 1-219 \$169.00
- **REAL TIME EXPERIMENTOR MULTI-PROCESSOR** contains a National COPS 402 processor with 20 I/O lines, serial I/O, counter, 2716 PROM with 2048 bytes for program instructions and 1064 nibbles (4 bits) of RAM. Included is a cross assembler and sample program source showing utility routines which handle I/O, memory, and other features. The COPS 402 may be read from or written to, may interrupt, or DMA (on Apple) to any place in the memory of the processor. May be used for any real time or process control requirements by incorporating a clock/timer routine.
TRS-80
Cat# 1-023 \$159.00
Apple
Cat# 1-221 \$159.00

- **SPEECH I/O HARDWARE MODULES** which allow speech (using a phoneme generator), Morse code, or alphanumeric data to be entered, digitized, stored, and reproduced will soon be available with applications for games, business, communications and many other activities. Support software is included with many application software packages available. Watch for announcements concerning applications and availability (for TRS-80 and Apple). Custom programming of voice output for commercial use will be offered.

- **APPARAT'S SCIENTIFIC ARITHMETIC PROCESSOR (ASAP)** provides faster processing of scientific functions when volume of calculations (number crunching) is beyond the computer's capacity during an acceptable time period. Handles interger or floating point numbers to 9½ digits of accuracy. Available are the following scientific functions: sin, cosin, tangent, logs, square root and many more.

Software designed to interface ASAP functions into BASIC or assembly language programs are provided.

TRS-80

Cat# 1-024 \$399.00

Apple

Cat# 1-222 \$349.00

- **INTEGRATED SALES & INVENTORY:** A total Manufacturer's Inventory Control System. Easy to use modular construction allows interfacing with Invoicing and Accounts Receivable. Manages inventory, sales and receivables with ease. Comfortably handles inventory as products comprised of components contained in the inventory. The system consists of the following modules which may be purchased separately:

Invoicing and Sales Subsystem

Model I/III

Cat# 2-188 \$175.00

Model II

Cat# 2-119 \$250.00

Apple Model II

Cat# 2-427 \$175.00

Manufacturing Inventory Control Subsystem

Model I/III

Cat# 2-120 \$175.00

Model II

Cat# 2-121 \$250.00

Apple Model II

Cat# 2-428 \$175.00

Accounts Receivable with Labeling Subsystem

Model I/III

Cat# 2-122 \$200.00

Model II

Cat# 2-123 \$300.00

Apple Model II

Cat# 2-429 \$200.00

Integrated Sales and Inventory System

Model I/III

Cat# 2-124 \$500.00

Model II

Cat# 2-125 \$700.00

Apple Model II

Cat# 2-430 \$500.00

- **PASCAL LEDGER** is a collection of programs that allows the user to have a complete computerized General Ledger system. It performs most of the tasks usually associated with computerized versions of the General Ledger system including: Up to 250 User Definable Accounts - Financial Reporting - Transaction Entry - Automatic Posting - Password Protection - Customization of Printer and Screen Characteristics for Turn-Key operation.

Included in the PASCAL LEDGER are the two system diskettes and complete documentation that shows step-by-step useage of the Pascal Ledger including Normal Daily Cycle, End-of-Week Cycle, End-of-Month Cycle, End-of-Quarter Cycle, End-of-Year Cycle. This General Ledger system is completely menu driven and does not require ANY computer programming knowledge. Comes already personalized with the user's company name installed on the system disks.

Cat# 2-431 for Apple II \$149.00

- **C-WRITE** is a CPA Client Write-Up System designed for use by professional accountants. Not a "warmed over" in house accounting system; this is a full accountants system designed for client batch entry. CP/M 8" standard disk.

Cat# 2-821 \$799.00

- **"BIONIC BASIC"** selectively implants modules directly into your Basic, significantly increasing its power and usefulness. You may choose any of the following implants or use all, as you see fit.

BASIC STARTER PACKAGE, FEATURES

A flashing and/or repeating cursor, with user-definable repeat rate & cursor character, and ability to switch the cursor and repeat on and off.

Move information from one area of memory to another, such as from screen to protected memory.

Chain programs - Run or load a new program with previous program variables intact.

Labels and numeric instructions with GOTO or GOSUB statements.

Change strings from upper to lower case and vice-versa.

Alter the "RESTORE" command allowing specific line reading instead of the program's first data statement.

Two other BIONIC BASIC packages are also available:

"Editing Features" package allows you to: Search program text for a specific string or Basic keyword, move blocks of lines within a program, and compress resident programs by deleting unwanted spaces and remarks.

"Array Features" package allows you to: Re-dimension arrays, search an array for a specific entry, and sort any one-dimensional array, numeric or string, in ascending or descending order. (This sort is fast - one hundred items in less than a second!)

But the best feature of BIONIC BASIC is its modularity. You need only install those modules you want to install. If you find you do not need a particular module you can "pull" it at any time.

BIONIC BASIC starter package

Cat# 2-100 For TRS-80 Model I..... \$49.95

Editing Package

Cat # 2-101..... \$19.95

Array Package

Cat# 2-102 \$19.95

Special Offer - all three packages only

Cat # 2-103..... \$74.95

STOCK ANALYSIS is a user oriented set of programs for analyzing the following:

- The potential new and probable risk ratio of specific stocks
- The overbought/oversold condition of specific stocks.
- The overbought/oversold condition of the market in general.
- The running averages for specific stocks or for the Dow Jones Averages.

These routines will help you select stocks which meet your investment objectives.

Cat# 2-127 For TRS-80..... \$49.95

- TRS-80 VOCAL SYNTHESIZER generates sounds from data files for the TRS-80 Synthesizer. Three output modes are available: Morse code, Spelled (both operate character by character), or Spoken (pronounces English or foreign language). Amazing results, considering the limitations of spelling versus pronunciation. (NOTE: Will also work with the Apparat synthesizer to be announced early summer.)

Cat# 1-026 \$49.00

- NEWTRIEVE replaces your BASIC sequential search with a machine language program. NEWTRIEVE is designed to be installed in any BASIC program that requires sequential searching of random access files for a particular string. NEWTRIEVE can search through 25,000 characters from the disk file to locate the string in question and identify the disk file record in which it is located in less than a second. Includes all documentation and sample programs. Also includes a utility program which simplifies installing NEWTRIEVE into your BASIC programs.

Cat# 2-090 For TRS-80..... \$49.95

- SMART TERMINAL 80, an advanced, flexible, and unique program to make your TRS-80 an intelligent terminal for communicating with another TRS-80, FORUM 80's™, THE SOURCE™, MICRO-NET™, or any sophisticated mainframe system available to you.

Manuscripts, documents, etc., may be prepared for off-line transmission on-line in block form or in prompted line-by-line form.

SMART TERMINAL 80 will transmit and receive BASIC programs and Editor-Assembler files. It transmits not one but two auto log-on messages and incorporates a lower case driver which may be toggled on or off. It will open or close your buffer automatically or manually for storage of incoming data or for transmission generation, detect key-bounce, and you may format your screen for the line length YOU desire without regard for the line length transmitted by the other system.

SMART TERMINAL 80 can store more than 30K bytes of data in your memory depending on your system size. You may redefine keys in order to send special codes required by some systems such as the square brackets required by MICRO-NET. Everything coming in or going out may be sent to your printer when you command it. Communications protocol and parameters are at your fingertips and may be selected at will, including full or half duplex.

SMART TERMINAL 80 stands alone as a unique communications package and when combined with THE APPARAT CONNECTION will end your communication problems.

Cat# 2-104 \$79.00

- FLEXTXT II supports the NEC 5510/5520 Serial and the NEC 5530 Parallel Spinwriters while implementing all of the SCRIPSIT II special printing features, such as: space, word, and character justification, boldface, superscript, subscript, multi-column printing, single and double underlining, overstrike, strike-through, and SWAP. Also, FLEXTXT II allows alternate character sets (such as italics) available on some Spinwriter print thimbles, and switching between 10 and 12 pitch spacing during printing. FLEXTXT II is self contained, requiring no modification to SCRIPSIT II while it performs the initialization of the TRSDOS parallel or serial (also configuring the Model II, Channel B, RS232-C) printer drivers. Available for the Model II and Spinwriter.

Cat# 2-106 \$29.00

The TRS-80 Pocket Computer has been described as a solution looking for an application. Apparat announces the first in a series of application packages for the TRS-80 Pocket Computer - its Pocket-80® series.

The first offering in the Pocket-80 series is a games package. Games are not only fun, they are an introduction to what a computer - any computer - can do. The Pocket-80 Games Package will include:

- Guess - Guess the secret number. Not a sophisticated game by any means, Guess is included mainly to show how to simulate random numbers on the Pocket Computer.
- Hamurabi - The classic game where you rule the kingdom of Sumeria. This program, which will fit snugly into a 4K TRS-80 Model I, Level I, shows just how much you can get into a pocket computer!
- Safecracker - Another "Guess the Number" type game, this one has a twist; your mission is to open a safe, which could contain anything from the secret plans you came for to officer O'Malley of the FBI!
- Pig - A dice game that's fun, but watch out! The pocket computer is hard to beat!
- Psych - This one is also hard to beat; the Pocket Computer begins by randomly choosing "heads" or "tails", but as it goes along it begins making its decisions based on what you have guessed before.

Cat# 2-107 \$14.95

- CMDX PROCESSOR functions as an extension to the TRS-80 Model I and III 16K computers. Although it is usable on disk systems, it is especially designed for cassette only units. CMD (X) adds 10 commands to Level II or BASIC III systems; string search, hexadecimal conversions, memory & variable displays, renumber, alter RAM, etc.

Cat# 2-128 \$24.95

THE EXTENDER by Scott Knaster. With Apparat's new Apple software package, The Extender, you can use the full power of PRINT USING from Applesoft, determine the amount of free space remaining on a diskette from within your programs, generate automatic line numbers, and much more.

The Extender provides 15 powerful statements and functions to make Applesoft programming easier. These commands add to your capability in business applications, graphics, debugging, disk management, and advanced programming.

Here is a brief description of some of the commands provided by The Extender:

- PRINT USNG - Easily formats output in columns, with automatic rounding, floating dollar sign, asterisk fill, preceding or trailing sign, and more features than any other similar system.
- AUT - Provides computer-generated automatic line numbers.
- DEC and HEX - Provide built-in conversion between hex and decimal. These functions can be used with POKE, PEEK, and CALL statements for easy programming.
- DISKFR - Instantly computes the amount of disk space free on any standard DOS 3.2.1 or 3.3 diskette.
- EDIT - Allows easier editing of Applesoft program lines by providing full-width listings. Eliminates typing POKE 33,33 to eliminate spaces.

The Extender works with your Applesoft programs by using the '&' command. Just boot with the Extender disk, the run, edit, or change your programs as usual, with all the power of these 15 additions at your fingertips.

The Extender comes on a 3.2.1 diskette and is fully compatible with both DOS versions 3.2.1 and 3.3. The Extender requires an Apple II or Apple II Plus with at least 32K, Applesoft in ROM or Language System, and a minimum of one disk drive.

Complete documentation is included with examples of usage for clarity and ease of implementation.

Cat# 2-410 \$49.00

APPARAT ANNOUNCES A MERGER

THE 737 LINE PRINTER AND SCRIPSITtm

Do you own a TRS-80tm Model I computer and the SCRIPSITtm Word Processing System? Do you own a Radio Shack LP IV (Centronics 737-1) line printer? Are you frustrated because you are unable to utilize the diverse capabilities of your 737-1 line printer with SCRIPSITtm?

If your answer is "yes" to all of the above, APPARAT has a nearly perfect solution. APPARAT introduces FLEXTXT, a product that brings SCRIPSITtm and the 737-1 printer together.

FLEXTXT is a software appendage to SCRIPSITtm that supports the use of all SCRIPSITtm provided print formats while exercising many expanded features of the 737-1 printer. Together, SCRIPSITtm and FLEXTXT make possible the dynamic selection of:

- * The proportional character set in normal and **extended** modes.
- * The compressed character set in normal and **extended** modes.
- * Right justified formatting using the proportional or compressed character sets (normal or **extended** modes).
- * Underlining in any of the SCRIPSITtm selectable formats, and FLEXTXT selectable character sets.
- * Your choice of superscripts or subscripts in any supported character set.
- * The intermixing and combining of the expanded 737-1 features anywhere within a document.

This SCRIPSITtm and 737-1 line printer merging is possible now through APPARAT. FLEXTXT can be purchased for:

~~\$29~~⁹⁵

Note: You must own SCRIPSITtm to use FLEXTXT. FLEXTXT is a stand-alone program activated by a modified SCRIPSITtm "PRINT" command (the modification is programmatically performed - no accident prone manual "zapping" is required). No SCRIPSITtm documentation is provided.

FLEXTXT use requires at least 1 disk drive and a TRS DOS type operating system (preferably NEWDOS/80 with its MINI DOS feature, allowing DIR and other DOS commands while the resident SCRIPSITtm file remains undisturbed).

This advertisement was produced using SCRIPSITtm and FLEXTXT, driving a Centronics 737-1 line printer.

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MICROPERIPHERAL CORPORATION

SERVING YOUR COMMUNICATION NEEDS

THE CONNECTION

A series of direct connect modems with auto answer, receive and/or dial capabilities

- The Apparat Connection (Microconnection) eliminates need for an expansion interface and/or an RS232 board by decoding the TRS-80 bus and creating an RS232 port. Provides serial printer output. Requires software written for Z80 port 208, and an adapter cable for the Model III.

Cat# 1-028 \$249.00

- RS232 CONNECTION replaces obsolete acoustic coupled modems on any system having an RS232 serial I/O port. Requires RS232 cable.

Cat# 1-029 \$199.95

- COLOR CONNECTION converts Radio Shack Color Computer into a communications terminal providing serial printer output. Additional memory or extended BASIC not required. Cables provided.

Cat# 1-030 \$199.00

- AUTO CONNECTION (option) permits CONNECTIONS (except Color) to answer the telephone and/or dial numbers automatically. Dialer demonstration program provided.

Cat# 1-031 \$79.95

- EUROPEAN CONNECTION (option) modifies above units for European Standards.

Cat# 1-032 \$29.00

- MODEL III ADAPTER cable converts Model III 50 pin bus to 40 pins, used by Model I peripherals.

Cat# 1-033 \$29.00

- RS232 CABLE, four foot ribbon cable terminates with 25 pin male DB25 plugs.

Cat# 1-720 \$24.00

Microperipheral Corp. offers one of the most complete lines of communication hardware and software available in the microcomputer industry.

Besides the above Connections, other models are available for the Apple, Atari and other micro computers.

CONNECTION SOFTWARE SUPPORT

MANUAL TERMINAL PROGRAMS (Specify Model I or III, with or without RS232, or Color)

- KEYCOM permits communications between your TRS-80 and virtually any other computer. Converts Level I, 4K, and Level II, 48K.

Cat# 2-112 \$19.95

- AUTOCOM is a user modified or expanded BASIC program with autodial routine (N/A for Color Computer).

Cat# 2-113 \$14.95

- TYPER routes LIST and LPRINT commands to serial printer connection for APPARAT/MICROCONNECTION or Color Computer.

Cat# 2-114 \$19.95

- SMART TERMINAL 80 is a flexible, unique program making your TRS-80 an intelligent terminal for communicating with any sophisticated main-frame system. Messages, manuscripts, documents, etc., may be prepared off-line for transmission, on-line in block form, or in prompted line-by-line form. Some of the many features are: Transmit and receive BASIC programs and Editor-Assembler files, transmit two auto log-on messages, automatic or manual storage of incoming data or transmission, auto repeat key, the ability to format line length you desire disregarding the transmitted line length, storage of more than 30K bytes of data in your memory (depending on system size), redefinable keys in order to send special codes, printer accessibility to incoming and outgoing data, and communications protocol and parameters, including full or half duplex, at your fingertips. The SMART TERMINAL 80 is a stand alone communications package, or can be combined with THE APPARAT CONNECTION for all your communication needs.

Cat# 2-104 \$79.00

COMPUTING POWER

MULTI- USER NETWORKING FOR THE TRS-80 AND APPLE

****A COMPLETE, YET ECONOMICAL SYSTEM****

(\$6,999 for a system having 1.2 megabytes of disk storage and four 64K user stations)

IF YOU NEED ANY OF THE FOLLOWING, OUR MULTI-USER NETWORKING SYSTEM IS FOR YOU

- * MORE THAN ONE COMPUTER**
- * COMMON ACCESS TO THE SAME DATA FILES**
- * PROGRAM DEVELOPMENT WHILE PERFORMING ONGOING APPLICATIONS**
- * ACCESS TO DIVERSIFIED APPLICATION SOFTWARE PACKAGES**
- * MINIMUM COST FOR MAXIMUM PERFORMANCE AND CAPACITY**

FEATURES SOFTWARE

- MP/M™ with CP NET™ provides multi-user network system control.
- Each user station operates CP/M (Note: a Model I or III TRS-80 may also operate in a standalone mode under NEWDOS, TRSDOS™ or any comparable operating system.)
- Since MP/M and CP/M are the most widely used network and single user operating systems, respectively, an extensive selection of commercial quality application software packages are available.

HARDWARE

- The network control station is a 4 megahertz Z80 based system. Using MP/M, the controller shares disk and printer resources (the most costly elements of a microcomputer) among all users providing immediate access to common data files. Exceptionally useful in an interactive environment such as order entry or inventory control.
- Disk storage capacity may be easily increased at any time, meeting a wide range of budgetary and information requirements, to the following limits:
 - Mini-Floppy Disks. Up to four 5¼ inch mini-floppy drives. Double density mode operations with a 3.2 megabyte maximum capacity. Available in 40 track, single sided (200K per drive), 40 track, double sided or 80 track single sided (400K), or 80 track double sided (800K)
 - Floppy Disk. Up to four 8 inch floppy drives, Double density mode operations with a 5 megabyte capacity.

- Winchester disks. Up to four 5¼ inch mini-Winchester disk drives with a 40 megabyte maximum capacity. Also available with tape backup option.
- The network control station can control one or more printers operating either Centronics parallel or RS 232 serial (optional). The printer spooling program, with MP/M, efficiently shares the printer(s) among several users via a priority scheme.
- The network control station can simultaneously manage up to eight user stations. Each user station connects to the control station on its own parallel port, eliminating contention problems found in most polled network systems.
- User stations may be any Z80 based computer capable of running CP/M. The TRS-80 models I, II, and III, and Apple computers can be easily and inexpensively configured to run CP/M (allowing disk and/or printer peripherals for local use), or MP/M (for shared peripheral use by all users).
- CP/M User Station featuring 24 lines of 80 characters, attributes (inverse, blink, etc.), 64K RAM, full keyboard with numeric pad and function keys in an attractive, detached keyboard case out performs and under prices the Apple and TRS-80 computers. Attachable to any video monitor capable of 12 megahertz bandwidth, or may be purchased with a high quality 9, 12 or 15 inch video monitor.

PRICES

- Network Control System from \$1,499 (200K disk) to \$24,900 (43 megabyte disk)
- CP/M User Station \$899 (monitor not included)

NAS

COMMERCIAL GRADE SOFTWARE FOR TRS-80 MODEL II™

RUNS ON 2 MEG FLOPPY
OR OUR 10 MEG HARD DISK SYSTEM
RUNS UNDER TRSDOS™ UTILIZING
INTERACTIVE PACKAGES
25 MAN YEARS OF FIELD TESTING
READY FOR YOU NOW

ORDER ENTRY WITH SALES ANALYSIS/SINGLE LEVEL BILL OF MATERIALS
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ACCOUNTS RECEIVABLE WITH INTERFACING WORD PROCESSING
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GENERAL LEDGER FULL YEAR DETAIL

PACKAGE PRICES FOR FLOPPY \$850.00 EACH
OR OUR HARD DISK \$950.00 EACH

ALL SYSTEMS INCLUDE EXTENSIVE SITUATION ORIENTED USER MANUALS
WITH NAS CUT AN INVOICE THEN AUTOMATICALLY UPDATE

- | | |
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| ●GENERAL LEDGER | FINISHED GOODS |
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| RECEIVABLES ACCOUNTS | OPEN ITEM |
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WHAT IS ON THE HORIZON?

HARK! A **VOICE**

YES FROM **NAS** SOFTWARE PACKAGES

FIRST TALKING TO YOU

LATER TALKING WITH YOU

EARLY 2nd QUARTER '81 SCHEDULED RELEASE

ALSO NAS WILL BE CONVERTING TO CP/M MID '81

FOR FURTHER INFORMATION CALL

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PICKLES & TROUT

P.O. BOX 1206, GOLETA, CA 93116, (805) 967-9563

FOR THE TRS-80 Model II

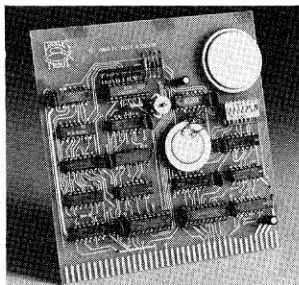
CCB-II

The CCB-II provides the following functions for a TRS-80 Model II:

A CLOCK
hour, minutes, second

A CALENDAR
day, day of week, month,
year

AN AUDIO ALARM



INFORMATIONS: The CCB-II mounts in the TRS-80 Model II and provides a machine readable clock/-calendar and an audio alarm. The clock and calendar are powered by a long-life lithium pacemaker battery which will give about 8 years of continuous operation.

The CCB-II is fully supported by P&T CP/M 2 - The system date and time are synchronized to the CCB-II each time the system is reset and the audio alarm can be sounded by sending an ASCII BEL character (control-G) to the console. For TRSDOS users, software is available which sets the system date and time by the CCB-II when the system is reset.

The CCB-II can be accessed directly from any language that allows direct port input and output. The user's manual for the CCB-II includes sample programs written in Microsoft Basic, CBASIC, Pascal/M, TRSDOS Basic, and assembler for directly accessing the CCB-II.

PRICES:

CCB-II
Cat# 1-042 \$175.00
TRSDOS software diskette
Cat# 2-126..... \$5.00

PLEASE NOTE: The installation of the CCB-II requires opening the Model II, which may void its warranty. We suggest that you wait until the warranty has expired before installing the CCB-II.

P&T CP/M 2

P&T CP/M 2 is an adaptation of the popular CP/M operating system for the TRS-80 Model II. P&T CP/M 2 has been carefully designed to utilize the hardware facilities of the TRS-80 Model II to maximum advantage. In addition to improved system performance, P&T CP/M 2 opens the door to using hundreds of currently available software packages that have been written for CP/M.

DISK STORAGE: P&T CP/M 2 supports standard single sided floppy drives (596K bytes of usable storage at double density), double sided expansion drives (1.2M bytes per disk), and the Cameo Electronics hard disk controller (10 - 80M bytes).

CRT CONTROL: The following built-in functions make console interaction easy: erase to end of line/screen, insert/delete line, cursor addressing, reverse video, split screen mode, read cursor location, and many more. The display capabilities are accessed by control codes, escape sequences, or simple system calls.

SERIAL I/O: The serial ports are tied into the normal CP/M I/O structure or can be accessed directly by programs with special I/O requirements. ETX/-ACK, XON/XOFF, and clear-to-send handshaking are fully supported. A special utility routine is provided to display the current status of the serial ports and allow the various parameters to be changed at will.

PARALLEL I/O: Options are provided for the Centronics port so that a printer with automatic line feed can be used with CP/M programs.

USEFUL SYSTEM FUNCTIONS: Also included are type-ahead buffer for keyboard input, automatic program execution, system time-of-day clock, system date, and access to the CCB-II.

UTILITIES: The standard CP/M utility programs are augmented by 14 utility programs that have been written specifically for the Model II.

DOCUMENTATION: P&T CP/M 2 comes with the standard Digital Research manuals plus the P&T CP/M 2 User's Manual which contains over 150 pages of information about CP/M and the additions and special utilities supplied by Pickles & Trout.

PRICES for P&T CP/M 2:

Single sided floppy version
Cat# 2-805..... \$185.00
Double sided floppy version
Cat# 2-822..... \$220.00
Cameo Hard disk controller version
Cat# 2-809..... \$250.00
Manuals only (for evaluation)
..... \$35.00

DEALER INQUIRES ARE WELCOME

Distributed By: Apparat, Inc.

Use our free Order Desk number 1-800-525-7674 (except Co, Ak, Hi)

**PICKLES
&
TROUT**

FILE TRAN

HIGH SPEED TRANSFER

Filetran is the fast, effective, easy to use file translation system that allows you to generate CP/M or TRSDOS compatible files. Filetran operates on a single computer system and transfers files bi-directionally between CP/M and TRSDOS operating systems using high speed disk-to-disk transfer techniques.

POWERFUL AUTOMATED FEATURES

- Filetran does much more than just transfer files. The lines function automatically finds and displays the program lines that contain incompatibilities between Level II BASIC and Microsoft's MBASIC 5.2 Making conversion to the more powerful MBASIC fast and easy. The lines function also allows the scan of any text file for all occurrences of any selected string. This provides the powerful capability of identifying any string sequence cross reference. The disk and MEM functions provide high-speed machine code disk sector and memory page displays in parallel HEX/ASCII format virtually at memory speed. The dir and files functions allow examination of both CP/M and TRSDOS directories without time-wasting system reload and the attendant disk switching operations. and for standard CP/M systems. A terminal configuration program is supplied which automatically configures filetran for use with the console terminal.

FEATURES

THE SOFTWARE PROFESSIONAL'S CHOICE

Selected sector disk displays

- Memory Displays
- Software Conversion Cost Analysis
- Program Conversion Aids

MANY POWERFUL APPLICATIONS

BASIC, FORTRAN, COBOL source language transfers to the operating system of your choice:

- Expand the Marketplace for Your Software to Include the "Other" Operating System
- If you're in the printing or typesetting business, expand your marketplace to include word-files made by the "other" operating system.

THE WORD PROCESSOR USERS SOLUTION

Use the Word Processing (WP) software of your choice and Filetran to meet your Client's needs:

- If you're doing "overflow" work then you can remain compatible with your client's system without additional equipment.
- If you're moving to new equipment, then Filetran your existing data to the new system.

- Take advantage of new WP developments without large transition costs!
- With Filetran you are able to pick the WP system that meets your needs and your pocketbook without limiting your potential customer base.

SPECIFICATIONS

- Single or bi-directional byte for byte file transfers of word processing files, high order language program files, assembly language source files, and data files.
- Transfers CP/M files to TRSDOS.
- Transfers TRSDOS files to CP/M.
- High speed machine code for disk & memory displays using video RAM capabilities.
- Special purpose disk I/O for TRSDOS MOD I directory compatibility.
- Terminal configuration feature for non-TRS80 terminals.
- Versions available for most CP/M based machines.
- Special versions available for TRS-80 MOD I & MOD II.

DISK ASSUMPTIONS

Assumptions are used primarily for warning.

- Filetran assumes standard TRSDOS formats for both TRS-80 Model I & Model II.
- For Model I, A & B are standard 5 1/4". 35 track, 10 or 18 sectors 128 or 256 bytes/sector.
- Drives C & D are standard 8", 77 track, 26 sector, 128 bytes/sector
- Custom disk configurations available on request
- Compatible with Omikron and Parasitic engineering hardware for mixed drive, standard CP/M systems.

REQUIREMENTS

CP/M operating system is mandatory (version 2.2 is recommended for systems other than TRS-80 Model I).

- Filetran is a machine language CP/M "COM" file.
- File transfers require dual disk.
- The system requires 48K of RAM (minimum).

Version 1.2 - Model I to CP/M only:

Cat# 2-823 \$99.00

Version 1.4 - Model I both directions

Cat# 2-824 \$149.00

Version 1.5 - Model II to CP/M only:

Cat# 2-825 \$99.00

**BUSINESS
MICRO
PRODUCTS**

609 S. Livermore Ave.
Livermore, CA. 94550
(415) 449-4412

Distributed By: Apparat

MICROSOFT

- BASIC-80 is probably the most extensive implementation of BASIC for CP/M. Release 5.0 supports new functions such as 40 character variable names, protected files, dynamic string space allocation, WHILE/WEND statements, chain and common, and variable length random file records.
(CAT # 2-810) \$350.00
- BASIC COMPILER, following the same syntax as the BASIC-80 INTERPRETER, allows writing of programs in interpretive BASIC for later compiling, and relocatable file mixing with FORTRAN-80, COBOL-80, and MACRO-80. Includes MACRO-80 Macro Assembler, CREF-80 Cross Reference Utility, and a BASIC library manager.
(CAT # 2-811) \$395.00
- COBOL-80 is a high speed COBOL compiler compatible with other Microsoft compilers, featuring MACRO-80, ANSI standard COBOL with STRING, UNSTRING, COMPUTE, SEARCH, PERFORM, ACCEPT/DISPLAY, and more.
(CAT # 2-812) \$750.00
- FORTRAN-80, a full ANSI FORTRAN X3.9-1966 FORTRAN, except COMPLEX data type, is compatible with other Microsoft Compilers. Includes MACRO-80.
(CAT # 2-813) \$500.00
- MACRO-80, an 8080 and Z80 Macro Assembler, including CREF-80 Cross Reference Facility and LINK-80 Linking Loader, is compatible with Microsoft Compilers.
(CAT # 2-814) \$200.00
- muLISP-80 is an Artificial Intelligence Development System, including muSTAR utility package and sample programs.
(CAT # 2-815) \$200.00
- muMATH/muSIMP. This symbolic math package computes to 611 digits with an exact solution of algebraic equations. Includes muSIMP symbolic and semi-numerical processing language.
(CAT # 2-816) \$250.00

CPAids

- NOTE: CPAids requires a small royalty fee for the use of Microsoft Compiled Code in their programs.
- MASTER TAX PROGRAM includes schedules A, B, C, D, E, F, G, R/RP, SE, TC, AND ES, plus forms 2106, 2119, 2210, 3468, 3903, 2441, 4625, 4726, 4792, 4797, 5695, and 6521, and features batch processing, input sheets and proforma.
(CAT # 2-817) \$995.00
- STANDARD TAX PROGRAM includes schedules B,C,D,E,F,G,R/RP, SE, TC and ES, plus forms 2106 and 2441.
(CAT # 2-818) \$495.00
- Apparat can supply nearly any CP/M software. If you don't see what you want, please call.

MICROPRO INTERNATIONAL

- WORD STAR is one of the most versatile word processors on the market today. Superscript, subscript, underline, boldface, strikeout and much more! Completely menu driven, simple to learn command set. Supports most video devices and printers automatically, with easy to use patch facilities for any others.
(CAT# 2-801)..... \$495.00
- MAILMERGE, an add-on utility package for Word Star, allows insertion of variables from data files into form letters and mailing lists. Insertion from files into other text with rejustification. Requires Word Star.
(CAT# 2-802)..... \$150.00
- DATASTAR is a completely menu driven database manager provides for quick and easy data entry, retrieval, and updating. Files fully compatible with Word Star.
(CAT# 2-807)..... \$350.00
- SUPERSORT is a sophisticated high-speed data sorting utility. Multikey, compatible with Microsoft Relocatable files.
(CAT# 2-800)..... \$250.00

PLAY IT AGAIN . . . MAESTRO? WITH TRS-80 ORCHESTRA-80

- With no musical knowledge at all, you can now enjoy the sweet strains which soothes savage beasts on any 16K TRS-80 microcomputer. ORCHESTRA-80 is a music synthesis system written by Jon Bokelman, manufactured by SOFTWARE AFFAIR, and distributed by APPARAT.
- SOFTWARE includes:
 - • DIGITAL SYNTHESIZER producing up to four simultaneous voices in a six octave range allows a trumpet, oboe, clarinet and organ to perform four part harmony. Or, alterations could modify any of the voices to imitate other instruments.
 - • MUSIC LANGUAGE COMPILER lets you enter your favorite written music in any key or time signature with a simple and easy to use system language. Whole notes to sixty-fourth notes, single, double or triple dotted, triplets, single or double accidentals, staccato, pizzicato, repeats, second endings, retard and modulation are all possible.
 - • FULL SCREEN EDITOR with blinking cursor provides easy entering of insert/delete characters, insert/delete lines, global character search, and automatic error detection/display.
- • FILE MANAGER stores and retrieves named program files on tape or disk. Sequential ordering for automatic loading and playing lets you jump up to the conductor's stand.
- • INITIALIZATION allows you to alter voices, selecting the standard four voice synthesizer, or a special high resolution, three voice version, or choose standard (1.77 MHz) or enhanced (2.66 MHz) clock rate.
- HARDWARE for ORCHESTRA-80 is a 1½x2 inch PC board containing the electronics necessary to convert the computer output into a high fidelity audio signal. Simply plug into the expansion interface connector, then connect your "orchestra" into the aux/tape/tuner input of any audio amplifier, and voila, music. No external power supply required.
- INCLUDED is tape and disk versions on cassette, completely assembled PC board, detailed instruction manual, and sample music programs.
- Available from APPARAT
(CAT# 1-020) \$79.95
MANUFACTURED BY:
SOFTWARE AFFAIR
SUNNYVALE, CA



MICRO CLUB MEMBERSHIPS

"How would you like to be one of the first to obtain new applications for your TRS-80® or Apple® and SAVE MONEY???"

A vast array of software, especially games, exists for your microcomputer, but software alone can only partially fulfill the power and usefulness of your computer.

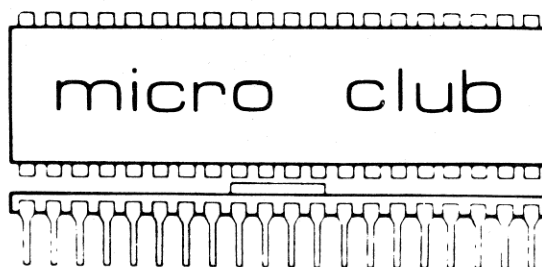
You probably own a disk and a printer—hardware which also enhances the usefulness of your computer. Other than these common peripherals, relatively little hardware exists in comparison to software, and most of the hardware available is prohibitively expensive.

The MICRO CLUB has been established to meet this need for a variety of inexpensive hardware devices—tools which will help you get more satisfaction from your computer.

Each month the MICRO CLUB will announce one or more new hardware products complete with complementary software and comprehensive documentation. Some products to be offered in coming months include a DATE/TIMER event timer, an energy efficiency MEASURING INSTRUMENT, and

a PROM BLASTER. Best of all MICRO CLUB members will usually pay less than \$100.00 for products which will eventually retail for \$150.00 or more.

Membership in the MICRO CLUB costs \$10.00 for 12 issues of our new products newsletter describing our product of the month as well as other hardware and software specials available exclusively to MICRO CLUB members. Even the membership is fully refundable i.e.: you will receive a \$10.00 discount on your first selection. Although there's no obligation to purchase any product, you need make only two selections during the 12 month period to have your membership automatically extended for another year.



APEX - A NEW DISK OPERATING SYSTEM FOR THE APPLE

- After two years of extensive development, APARAT is proud to announce APEX, a completely professional, programmable, file maintenance disk operating system for the APPLE II. Some of the multitude of disk operations are: a command structure similar to CP/M and mainframe operating systems, containing 20 command words, plus the ability to treat external programs as transient commands to the operating system, simple communication channels between operating system and user program allowing easy interfacing, capability of handling both 5 and 8 inch disks on the same system, safety features which include backup files and directory, read-after-write and size limit checks protecting against data loss, speed 4 times faster than CP/M, automatic default structure eliminating tedious typing by automatically setting up command strings, file names and extensions, fully functional on single and multi-drive systems, with utilities for single or multi-drive file copy, and a device handler structure for interfacing non standard peripherals.

The basic APEX package includes a high speed (1900 line/minute) two pass resident assembler which generates an alphabetized symbol and

cross reference table, a powerful macro editor with 18 commands, 10 text buffers and the capability of performing complex editing tasks, plus all the necessary tools for a complete assembly language development system.

- The complete APEX package includes operating system, assembler, editor, user manuals, and a complete utility set to maintain files on single or multi-drive systems. Supplied on 5" diskette requiring a minimum of 48K and 1 disk.

Cat# 2-404 \$99.00

Some related software development tools available for the APEX system are:

- XPLO - A block structured PASCAL-like system language, now with floating point.

CAT# 2-405..... \$79.00

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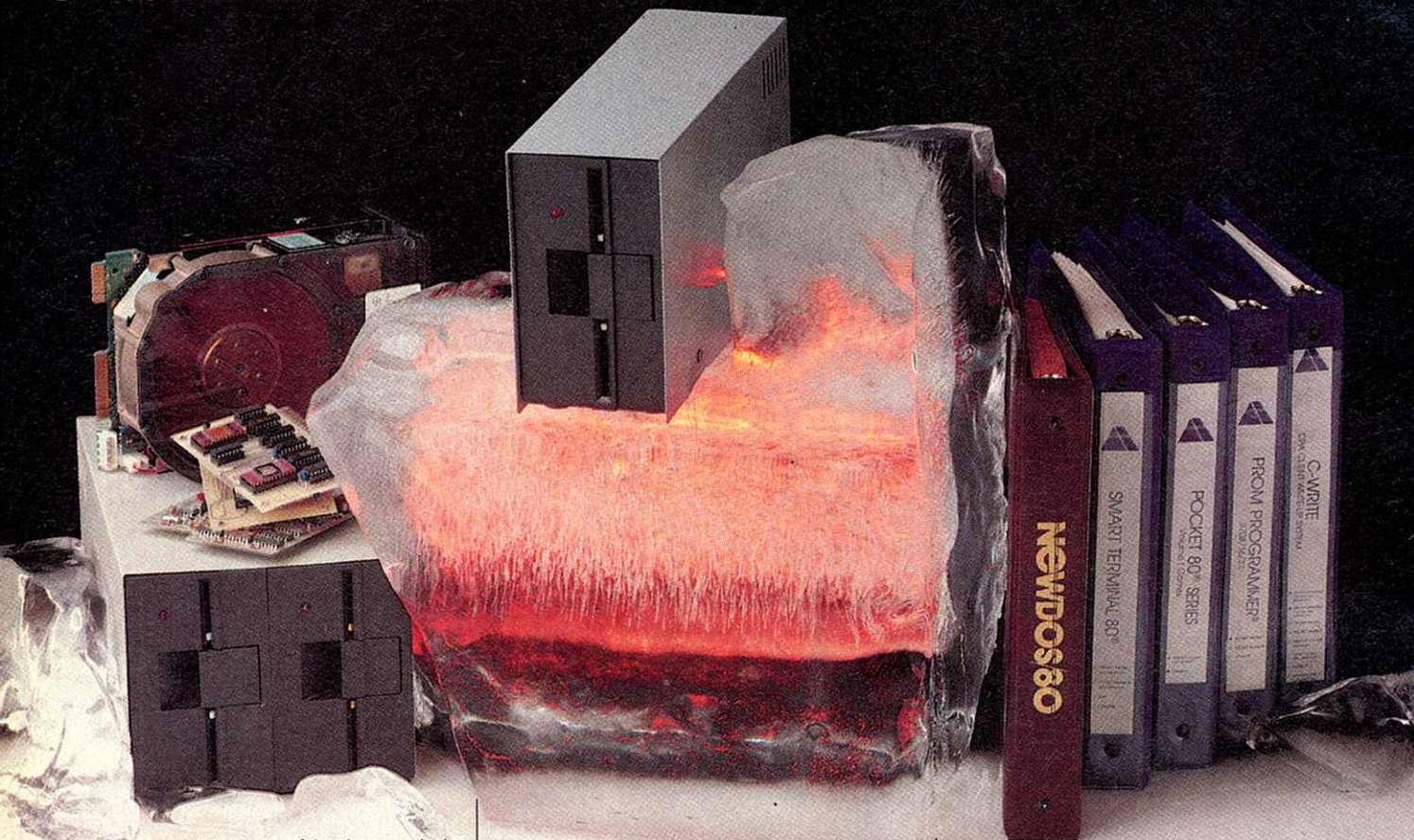
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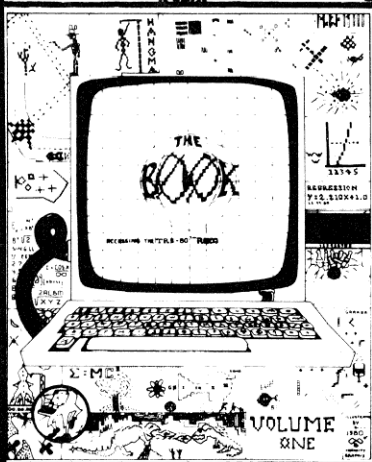
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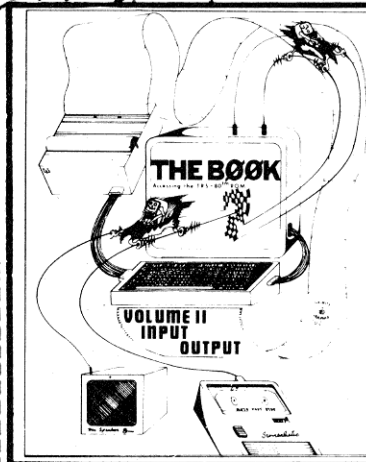
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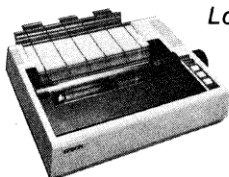


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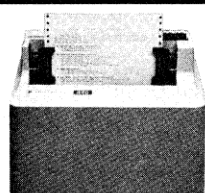
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In this first of a 3-part series, the author discusses using disk commands in unusual ways... without disks.

Advanced Graphic Techniques— Part I

Bob Boothe
4651 Browndeer Lane
Rolling Hills Estate, CA 90274

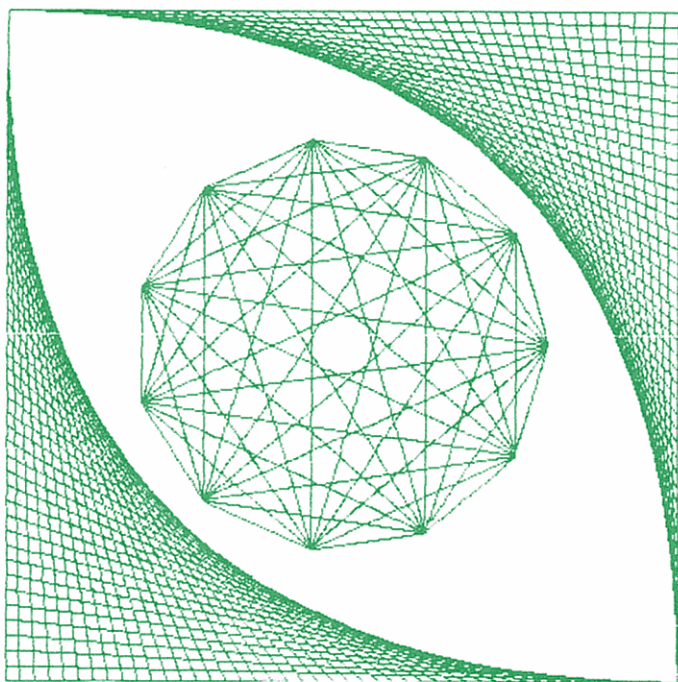
You have probably looked through this article and concluded that other than one picture, this article has nothing to do with graphics. You're only partially right. This is the first article in a series of three in which I will explain how to make pictures, like the one shown, on a dot matrix printer.

Look closely; that picture was not made on a plotter, but on a Base 2 printer with a 32K Level II TRS-80. Furthermore, the entire design took only a couple minutes.

This month, I will tell you how to make the disk commands do anything you want, such as drawing lines on the video or the printer. In Part 2, I will explain the program which makes designs like this one, as well as ten other designs. In Part 3, I will rewrite the program to draw lines on the video and to manipulate representations of three dimensional objects.

The Search

Continuously I search for little tricks to enhance the capabilities of the TRS-80. Program Listing 1 is a simple routine that allows you to PEEK at any location in ROM or RAM. Type it in and run it. It asks for an address to start its PEEK. If you want to look where the program is stored, type 17129. This is the start of the program text according to the reference manual. (Of course, if you have one of the new ROM's, everything



Design created in two minutes, printed on a Base II dot matrix printer.

is going to be different.)

Next, the program asks for the address where it should stop PEEKing. To go to the end of 16K memory, type 32767. These are both default cases, if you simply press enter. The program will start displaying addresses followed by the contents of each address, four per line. Now, press C for change, and it will start over again.

If you type 16722 for the start address and 16805 for the end address. The computer should print 195, 45, 1, 195, 45, 1 through the entire block. Since this seemed odd to me, I took out my Z-80 book and looked up 195, 45, 1, which turned out to be JP 301. I then entered a machine language routine to jump to address 301 and got an L3 ERROR. This started me thinking: The only way to

get an L3 error is to type in a disk command, and therefore, each disk command probably jumps to one of these addresses. If you don't own any disks, it jumps to the L3 error routine. However, we sly non-disk users can use the disk commands if we just change the address after the jump. In other words, change the (JP 301) to a (JP 32000), where we put our own routine.

What Goes Where

Now comes a problem: What command uses what address? If we mess this up, the SAVE routine might LOAD, the LOAD routine might clear the screen, and the KILL routine might short

out the keyboard. This is where Program Listing 2 comes in.

How can any program that short do anything? Well, all it does is start at the beginning of the ROM and print the contents of each address, if it is an uppercase letter. If an address contains a letter, the program prints it, otherwise it prints a space. When you run this program, (now would be a good time), it will print a couple of lines of garbage, and then print "MEMORY SIZE RADIO SHACK LEVEL II BASIC." On the machine with the new ROM the message has been shortened.

After it prints the message, it will continue printing garbage for sometime, until it hits the table of reserved words (Table 1).

Continued on page 126

Three dimensional, rotating graphics for printer and video.

A Turn of the Screw

Bob Boothe, 4651 Browndeer Lane, R.H.E. CA 90274

I have always envied the high resolution graphics of other computers. So, I decided to see what my 80 could do.

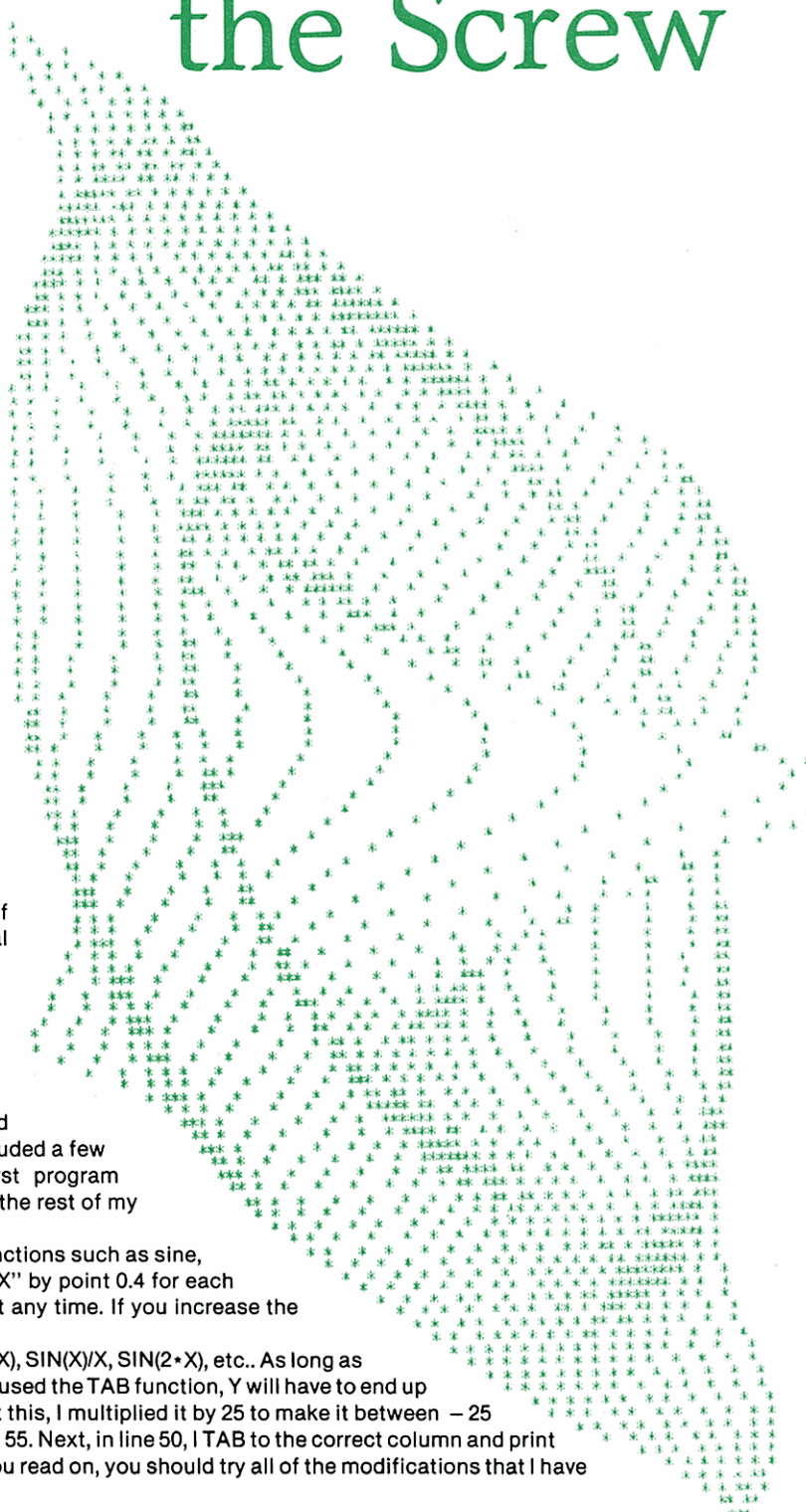
When I started to fool around with it, I discovered some amazing graphics capabilities. I began with some simple sine waves and then progressed from two dimensions to the third. After a lot of work, I finally developed a program that plots the beautiful surfaces you see in the pictures.

I have included a total of seven short programs. The nice thing about graphics is that most programs are very short, although usually not simple or fast. The first few start off fairly easy, but as you progress through the programs to the final program (which will draw a picture of a square thread screw horizontally on the screen) you will call a machine language routine to rotate it.

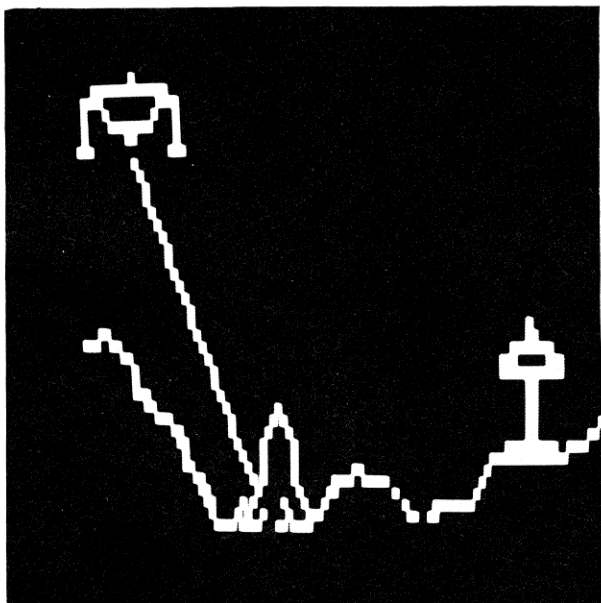
I hope that you are sitting at your TRS-80, because you are going to have to type in each program as we go along. If you don't, you will be totally confused by the end of this article. All right, type in the first program and experiment around a little. After the listings of many of these programs, I have included a few modifications which you should try. I will explain this first program thoroughly because the concepts in it will be used throughout the rest of my programs.

With the TRS-80, all trigonometric functions use radians. Functions such as sine, therefore, have a period of 2π . Line 20 increments the angle "X" by point 0.4 for each line printed. This results in roughly one period on the screen at any time. If you increase the point 0.4 there will be more than one period on the screen.

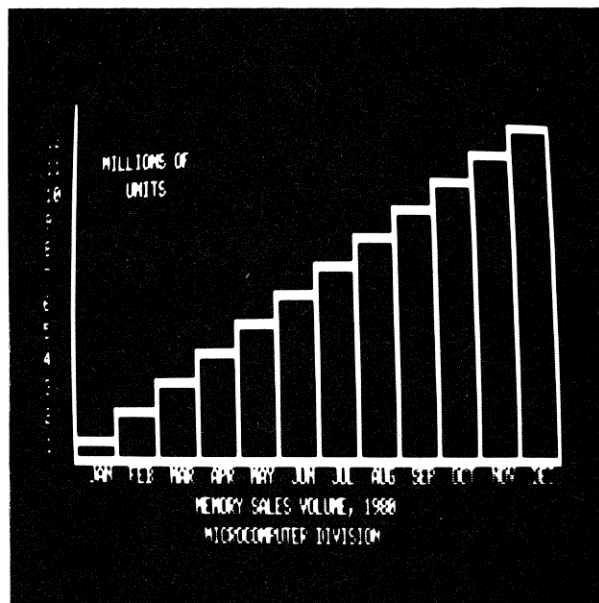
Line 30 finds the value of our function. You can also use $\text{COS}(X)$, $\text{SIN}(X)/X$, $\text{SIN}(2 \cdot X)$, etc.. As long as the value is between -1 and $+1$, any function will work. Since I used the TAB function, Y will have to end up between 0 and 63. After line 30, it is between -1 and $+1$. To fix this, I multiplied it by 25 to make it between -25 and $+25$, and then, I added 30 so that it falls between $+5$ and $+55$. Next, in line 50, I TAB to the correct column and print an X. Line 60 puts the program into a continuous loop. Before you read on, you should try all of the modifications that I have



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ANIMATION



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"What I have done is create two sine curves. One is in the horizontal x direction, and the other is in the diagonal y direction."

listed and a few modifications of your own. If your screen displays an OS ERROR, execute a CLEAR 100.

For printing one sine wave, the TAB function is great, but it just doesn't work for several functions on the same line. This is the purpose of Program Listing 2. Type it in and try to figure out how it works before you read on.

Basically, what I have done is create an array which represents each line in the printout. Line 50 fills it with spaces and line 100 changes the character at the computed position for each of our three curves. Lines 70, 80 and 90 compute the three positions of the symbols. Finally, line 110 prints the array on the screen. Again, modify this program until you understand how it works.

Short not Simple

Program Listing 3 will allow you to make some neat looking plots. It is similar to Program Listing 2 except that it uses one 63 character string, and it can use words and phrases instead of just single characters. Type in the program and enter your first, middle and last names. A very good looking example is with a first string of 40 asterisks, a second string of 25 equal signs, and a third string of eight periods.

Up to this point, you have not seen a slow program. Program Listing 4 satisfies this condition. Type it in and run it while you continue to read. It should take about twelve minutes to finish.

What I have done is create two sine curves. One is in the horizontal X direction, and the other is in the diagonal Y direction. I multiply the value of these two curves and expand it so that it fills the screen. The real trick is to erase the portions of the surface which are hidden by the large lamp.

This is accomplished by starting at the base level of the plane and RESETing all of the points vertically until the correct height is reached. (H is the height variable.) Another important feature is the "IF X/2 = INT(X/2)" statement in line 90. This condition is true only for even X values, and it gives the surface a checkered appearance.

If you are starting to get confused, remember, these programs are short, not simple. Fortunately, you can still enjoy the programs and the graphics they generate even if you don't completely understand them.

```
10 REM PROGRAM NO. 1 SINE WAVE
20 X=X+.4
30 Y=SIN(X)
40 Y=Y*25+30
50 PRINTTAB(Y) "X"
60 GOTO20
100 ' MODIFICATIONS
20 X=X+.2
30 Y=SIN(X)/X
40 Y=Y*10+45
50 PRINTTAB(Y) "TRS-80"
50 PRINTSTRING$(Y, "X")
50 PRINTSTRING$(Y, " ");STRING$(63-Y, "X")
```

Program Listing 1. Sine Wave

```
10 REM PROGRAM NO. 2 MULTIPLE SINE WAVES
20 CLEAR100
30 DIM P$(63)
40 D=2*3.14/3
50 FORQ=1TO63:P$(Q)=" ":NEXT
60 X=X+.3
70 Y1=SIN(X)*25+30
80 Y2=SIN(X+D)*25+30
90 Y3=SIN(X+2*D)*25+30
100 P$(Y1)="1":P$(Y2)="2":P$(Y3)="3"
110 FORQ=1TO63:PRINTP$(Q);:NEXT:PRINT
120 GOTO50
130 ' MODIFICATIONS
50 FORQ=1TO63:P$(Q)=" ":NEXT
70 Y1=SIN(X)/X*25+30
```

Program Listing 2. Multiple Sine Waves

```
10 REM PROGRAM NO. 3 USING WORDS
20 CLEAR1000
30 DIMS$(3)
40 D=2*3.14/3
50 FORQ=1TO3:PRINT"ENTER STRING NO. ";Q:INPUTS$(Q):NEXT
60 FORQ=1TO3:L(Q)=LEN(S$(Q)):NEXT
70 A=A+.2
80 T$=STRING$(63,32)
90 FORQ=1TO3
100 Y=SIN(A+D*Q)*(30-L(Q)/2)+31-L(Q)/2
120 T$=LEFT$(T$,Y)+S$(Q)+RIGHT$(T$,63-Y-L(Q))
130 NEXTQ
140 PRINTT$
150 GOTO70
```

Program Listing 3. Using Words

Plotting Problems

After spending a few days plotting different surfaces on the video, I found two problems. The first problem was how to add more detail to the plots to make them look better. And secondly, if you hit BREAK your plot would be lost forever.

The solution to both of these problems is with a printer. I own a Base 2 Printer, and fortunately, it is better suited for

graphics than most printers. I have found that the quality of a plot is directly proportional to the number of characters which you can cram into a certain area. The Base 2 Printer can not only print 132 columns per eight inch horizontal line, but can also print more than six lines per inch vertically. Line 15 is only for this printer since it outputs the numbers which select 132

Continues to page 124

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Convert, by SuperPIMx author Chuck House. It changes number bases from hexadecimal, decimal, octal, binary—from any one to any other! House also contributed his disassembler, which is winner of the Richcraft Engineering (Disassembled Handbook for TRS-80) Fastest Footrace contest.

Disassembled Handbook author Robert M. Richardson contributed three Basic programs which allow transmitting and receiving Morse code at speeds to 40 words-per-minute, without clock speedup. Morse appeared in Disassembled vo. II and III.

Basic Page Lister was adapted by House, and prints beautifully-formatted program listings.

Allen R. Greenburg contributed a professional-quality amortization-schedule preparation program, and a Multiplication-Tables Tutor.

Also on Tape 9: Loan Payback by Dan Connors, Resonant Frequency by Steve Simic, and Feedback System Stability Analysis by Phil Dunn.

Gary Petersen contributed Distance Formula for X-Y axis, and Bruno M. Larsen submitted a mailing list and sales-record-keeping program. Carey Tyler Schug contributed a parser routine.

Games include Solitaire, Boggle, an extremely fine Hangman, and a four-part quiz on American History, inventions, American wars and U.S. territories. The quiz is by Ronald N. Goulden, and is followed by one on presidents and states, which is so difficult the challenge is to answer at least half the questions correctly.

Piet & Jon Spiessens (Spiesoft) of Aartselaar, Belgium submitted Sherlock detective game and Word Search (guess opponent's word).

Also on Tape 9 is Motorcycle Jump by Russell Starkey and Robot by Wm. J. Schuler (original by W. Lappen), who also submitted Sea Search.

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```
10 REM PROGRAM NO. 4 3-D SURFACE
20 CLS
30 PI=3.14
40 FORY=0TO29
50 FORX=0TO80
60 H1=SIN(Y/29*2*PI-PI/2)+1
70 H2=SIN(X/80*2*PI-PI/2)+1
80 H=H1*H2*7.7
90 FORQ=1TOH:RESET(X+Y,Y+18-Q):NEXTQ:IFX/2=
INT(X/2) THENSET(X+Y,Y+18-Q)
100 NEXT X
110 NEXT Y
120 GOTO120
130 ' MODIFICATIONS

70 H2=SIN(X/80*4*PI-PI/2)+1
80 H=H1*H2*4
```

Program Listing 4. Three Dimensional Surface

```
10 ' PROGRAM NO. 5 3-D GRAPHS ON PRINTER
15 ' LPRINTCHR$(27);CHR$(52);CHR$(27);CHR$(98);
CHR$(13)
16 ' LINE 15 IS FOR BASE 2 LINE PRINTER ONLY
17 ' IT SETS 132 CHARS/LINE, 11.08 LINES/INCH
18 ' IF YOUR PRINTER DOES NOT PRINT 132 COLUMNS, YOU
19 ' WILL HAVE TO REDUCE ALL NUMBERS PROPORTIONATELY.
20 CLS:CLER500
30 DEFINT H-Z
40 DIMA$(132)
80 FORX1=1TO121
90 H=0:L=200
100 FORQ=1TO132:A$(Q)=" ":NEXT
110 FOR Y=1TO80
120 X=(X1-Y)*2
130 IF X<1THEN260
140 IFX>80THEN250
150 C=SQR((X-40)*(X-40)+(Y-40)*(Y-40))+1
170 M=X+EXP(-.004*C*C)*75+5
180 IFM>H THEN210
190 IFM<L THEN230
200 GOTO250
210 H=M
220 IF M>L THEN240
230 L=M
240 A$(M)=" "
250 NEXTY
260 FORI=1TO132:LPRINTA$(I);:NEXT
270 NEXTX1
280 ' MODIFICATIONS

170 M=X-EXP(-.004*C*C)*75+40
170 A=C*.1213+.63:M=X-SIN(A+A*6)/A/SQR(A)*50+40
260 FORI=1TO131:LPRINTA$(I);:NEXT:LPRINT
```

Program Listing 5. 3-D Graphs on a Printer

```
10 REM PROGRAM NO. 6 3-D SURFACE WITH SINGLE DOTS
20 REM ONLY FOR USE WITH A BASE 2 PRINTER
30 LPRINTCHR$(27);CHR$(50);CHR$(27);CHR$(98);CHR$(14)
40 CLS
50 DEFINT H,L,M,I,Q,X,Y,F,A
60 DIM A(7,576)
70 A1=0
80 FORX1=1TO484
90 A1=A1+1
100 H=-2000:L=2000
```


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```

110 N1=.09:N2=.0001
120 FORY=1TO320
130 X=(X1-Y)*2
140 IFX<1THEN270
150 IFX>320THEN260
160 D1=SQR((X-240)[2+(Y-80)[2]*N1+N2
170 D2=SQR((Y-240)[2+(X-80)[2]*N1+N2
180 M=X+180-SIN(D1)/D1*320-SIN(D2)/D2*220
190 IFM>HTHEN220
200 IFM<LTHEN240
210 GOTO260
220 H=M
230 IFM>LTHEN250
240 L=M
250 A(A1,M)=1
260 NEXTY
270 IF A1=7 THEN290
280 NEXTX1
290 LPRINTCHR$(27);CHR$(99);:FORQ=1TO576
300 LPRINTCHR$(128+A(1,Q)+A(2,Q)*2+A(3,Q)*4+A(4,Q)*8+A(5,Q)*
    *16+A(6,Q)*32+A(7,Q)*64);
310 FORA1=1TO7:A(A1,Q)=0:NEXTA1
320 NEXTQ
330 LPRINT
340 A1=0:GOTO280
    
```

Program Listing 6. 3-D Surface with Single Dots

```

10 ' PROG # 7 ROTATING SCREW
20 CLS
30 CLEAR500
40 DIM P(47)
50 A=0:XC=-1
60 PI=3.1416
70 A=A+PI/29.5:IFA>2*PI-.001THENA=0
80 XC=XC+1
90 FORQ=0TO47:P(Q)=0:NEXT
100 B=A-PI:IFB<=0THENB=B+2*PI
110 IF A<=PI/2 THEN P(COS(A)*16+24)=1
120 IF A<=PI OR A>=7*PI/4 THEN P(COS(A)*23+24)=1
130 IFB<=3.982661 THEN P(COS(B)*23+24)=1
140 IF B>=PI/2 AND B<=PI THEN P(COS(B)*16+24)=1
150 IF A<=PI THEN P(47)=1
160 IF A<= 2.300524 THEN P(8)=1
170 IF B>= 0.8410687 AND B<=PI THEN P(40)=1
180 IF A>PI THEN P(1)=1
190 FORQ=0TO47:IFP(Q)=1THENSET(XC,Q)
200 NEXTQ
210 IFXC<127THEN70
220 RESTORE B$="" :FORQ=1TO50:READA:B$=B$+CHR$(A):NEXT
230 W=VARPTR(B$)
240 POKE16526,PEEK(W+1):POKE16527,PEEK(W+2)
250 X=USR(0)
260 Z$=INKEY$:IFZ$=""THEN270ELSE ST=VAL(Z$)*40
270 FORQ=1TO50:NEXT
280 GOTO250
290 DATA 33,254,63,17,255,63,1,255,3,237,184,14,16,17,0,60,33,63
300 DATA 0,25,237,160,229,209,121,183,32,244
310 DATA 62,16,33,0,60,229,209,19,1,4,0,237,176,17,60,0,25,61
320 DATA 183,32,240,201
    
```

Program Listing 7. Rotating Screws

```

00100 ;MACHINE LANGUAGE ROUTINE CALLED BY PROG # 7
00110 ;
0000 21FE3F 00120 LD HL,16382 ;1 BEFORE END OF VIDEO
0003 11FF3F 00130 LD DE,16383 ;END OF VIDEO MEMORY
    
```


"With the TRS-80, all trigonometric functions use radians. Functions such as sine, therefore, have a period of 2 pi."

characters per line and 13 half dot vertical line spacing (about 11 lines per inch). Pictures three and four were created with this program.

If your printer outputs exactly 132 characters per line and automatically prints when the buffer is full, this program should work as written.

However, printers vary, so I will warn you of two modifications which you may need to make. If your printer only prints when it receives a carriage return, use line 260 in the modifications section.

A more difficult problem is if your printer prints less than 132 columns. To fix this you will have to multiply all of the numbers by a certain ratio. For example, if you own an 80 column printer the ratio would be 80/132. The only items which would not be multiplied would be the line numbers and the "X=(X1-Y)*2" statement in line 120. The important variables are X1, X and Y. X1 is the vertical line counter. X is the x coordinate, and Y is the y coordinate. I use the point (X,Y) and the center of the surface (40,40) to find the distance from the point to the center. Line 170 then uses this distance just as X was used in Program Listing 1 to compute the value of the function.

Next, I use a high and low counter to find out if a point should be hidden. If it falls outside of this range, I add it to my array just as I did in Program Listing 2. Now you see why I started out with the simple concepts.

We will cover Program Listing 6 very quickly because it can be used only by the Base 2 Printer or other printers that output single dot graphical data. The only difference between this program and Program Listing 5 is that this one stores seven lines and prints them all at once. (See pictures one and two.) The surface was created with two SIN(X)/X equations with different centers.

Picture two is the same surface as picture one except that the surface has been rotated 90 degrees by changing the centers in the two distance equations. Before any of you get to eager to try this one, I must warn you that these plots took eight hours and forty five minutes each. Don't run the program now, but, instead, run it before you leave for work, and it should be done when you get home.

Many of you don't have printers and are probably disappointed that you cannot use Programs 5 and 6. So that everyone is happy, I have included this last program that rotates a graphical pre-

```

0006 01FF03 00140 LD BC,1023 ;NO. OF BYTES TO MOVE
0009 EDB8 00150 LDDR ;SHIFT VIDEO ONE BYTE UP
000B 0E10 00160 LD C,16 ;LOOP COUNTER 16 LINES
000D 11003C 00170 LD DE,15360 ;START OF VIDEO
0010 213F00 00180 LOOP LD HL,63 ;POSITION OF LAST CHAR.
0013 19 00190 ADD HL,DE ;FIND ADDRESS
0014 EDA0 00200 LDI ;COPY EDGE. DEC C
0016 E5 00210 PUSH HL ;MAKE DE = HL
0017 D1 00220 POP DE ;
0018 79 00230 LD A,C ;GET COUNTER
0019 B7 00240 OR A ;IS COUNTER ZERO?
001A 20F4 00250 JR NZ,LOOP ;IF NOT, DO AGAIN
00260 ;THIS NEXT PORTION DISTORTS THE LEFT EDGE
001C 3E10 00270 LD A,16 ;LOOP COUNTER 16 LINES
001E 21003C 00280 LD HL,15360 ;START OF VIDEO
0021 E5 00290 LOOP2 PUSH HL ;MAKE HL= DE
0022 D1 00300 POP DE ;
0023 13 00310 INC DE ;MAKE DE = HL + 1
0024 010400 00320 LD BC,4 ;NUMBER BYTES TO REPEAT
0027 EDB0 00330 LDIR ;COPY THEM
0029 113C00 00340 LD DE,60 ;LENGTH OF REST OF LINE
002C 19 00350 ADD HL,DE ;HL = START NEXT LINE
002D 3D 00360 DEC A ;DECREMENT COUNTER
002E B7 00370 OR A ;IS A = 0?
002F 20F0 00380 JR NZ,LOOP2 ;NO. DO AGAIN
0031 C9 00390 RET ;YES. BACK TO PROGRAM
0000 00400 END
00000 TOTAL ERRORS

LOOP 0010 00180 00250
LOOP2 0021 00290 00380

```

Machine Language Routine Called by Program Listing 7

sensation of a screw on the screen. Type it in and try it before I tell you how I cheated. Have you run it yet? I hope so, because then you will know what I am talking about.

It probably appears to you as if the screw is moving sideways on the screen. If this isn't how it appears to you, turn the contrast on your monitor down, and the brightness up. Stand back, squint your eyes, and try to imagine that it is turning. By the way, this program uses the numeric keypad as a throttle. Press 9 and it should almost stop. The 0 key is the fastest speed.

Program Listing 7 is very similar to Program Listing 2 except that I have used four sine waves and four straight lines. The large number of IF statements were used to print only the portions of these lines that would have been seen in an actual screw. The data at the end of the listing is for the machine language program. I included a listing of it in case some of you were interested.

I hope you have learned about plotting sine waves, and were able to modify Program Listing 5 to work with your printer. If you don't have a printer, you may want to modify Program Listing 5 so that you can avoid all of the RESETing time in Program 4.

If you have a compiler, this is the type of application where that extra speed will really count. ■

NEW

Joystick versions of the Fantastic Games by BIG 5 (see page 211) and Software Innovation (see page 39). Available on tape or disk, same price as plain version. One "Stick 80" works with all. Money back guarantee. In stock now.



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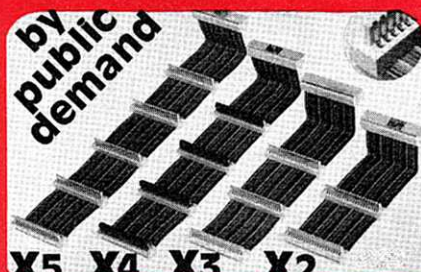
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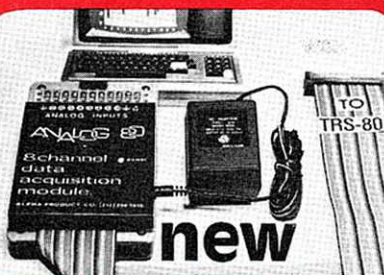


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IBM and all the "biggies" are using green screen monitors. Its advantages are now widely advertised. We feel that every TRS-80 user should enjoy the benefits it provides. But **WARNING:** all Green Screens are not created equal. Here is what we found:

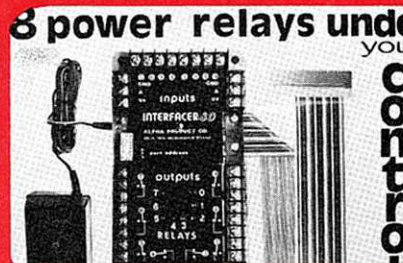
- Several are just a flat piece of standard colored Lucite. The green tint was not made for this purpose and is judged by many to be too dark. Increasing the brightness control will result in a fuzzy display.
- Some are simply a piece of thin plastic film taped onto a cardboard frame. The color is satisfactory but the wobbly film gives it a poor appearance.
- One "optical filter" is in fact plain acrylic sheeting.
- False claim: A few pretend to "reduce glare". In fact, their flat and shiny surfaces (both film and Lucite type) ADD their own reflections to the screen.
- A few laughs: One ad claims to "reduce screen contrast". Sorry gentlemen but it's just the opposite. One of the Green Screen's major benefits is to increase the contrast between the text and the background.
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"This month, I will tell you how to make the disk commands do anything you want, such as drawing lines on the video or the printer."

This table was produced with Program Listing 3. The way this table is stored in ROM is a much more compact and less readable form. In ROM, all the words are crammed together like sardines in one long block. In order to signify the start of each word, the ASCII code of the first letter, such as 69 for E in the word END, is added to 128, which makes 197, and is stored as the first letter. To decode this, I print letters until I get to one which has an ASCII number greater than 128, and then I tab to the next column and print the letter. I also included a counter, N, which is the number which the interpreter stores when you type one of these reserved words.

Now we have a list of reserved words, we can start filling in the addresses as we find them. Those I have found are in Tables 2 and 3. Table 2 is in numerical order, and Table 3 is in alphabetical order. I included USR even though it is not one of the disk commands.

Finding these addresses was a lot of work which few fools will want to repeat, especially since I already provided the addresses for you. However, this is basically

how I found addresses: I took one address at a time which followed one of the 195s.

Then I POKed the address of my own routine into the two bytes which were occupied by the 45 and the 1.

I used the screen white out routine from Radio Shack's Editor/Assembler manual. Next, I started typing in disk commands and getting L3 errors until a word finally made the screen turn white. I continued this until I had gone through the section. For a few addresses, I could not find a disk command to go with it.

New Commands

The procedure for using these new commands is fairly simple. First, write a machine language routine. Second, decide on the word you want to use, and find its address in the alphabetical table (Fig. 3.) Third, POKE the LSB (Least Significant Byte) into the address, and POKE the MSB (Most Significant Byte) into the next higher address. That is all it takes to use one of the commands.

Program Listing 4 demonstrates exactly how to use the disk commands. The program is a Road Race game in which you must drive a car down a winding road filled with potholes. Naturally, if you hit a pothole or the side, that is the end of the road. There have been many of these games written; the problem with them all is that the car is always driving in reverse. It starts at the top of the screen, and the obstacles move up the screen as it because that is the way the vid-

```
10 REM PROGRAM NO. 1      PEEK ROUTINE
20 S=17129
30 E=32767
40 INPUT"START ADDRESS";S
50 INPUT"END ADDRESS";E
60 FOR A = S TO E
70 PRINT A;PEEK(A),
80 Z$=INKEY$
90 IF Z$<>"C" THEN NEXT A
100 GOTO20
```

Program Listing 1

```
10 REM PROGRAM NO. 2      LOOK FOR WORDS
20 FOR A = 0 TO 13000
30 C = PEEK(A)
40 IF C>64 AND C<91 THEN PRINTCHR$(C);:ELSEPRINT " ";
50 NEXT A
```

Program Listing 2

| | | | |
|--------------|-------------|------------|------------|
| 128 END | 129 FOR | 130 RESET | 131 SET |
| 132 CLS | 133 CMD | 134 RANDOM | 135 NEXT |
| 136 DATA | 137 INPUT | 138 DIM | 139 READ |
| 140 LET | 141 GOTO | 142 RUN | 143 IF |
| 144 RESTORE | 145 GOSUB | 146 RETURN | 147 REM |
| 148 STOP | 149 ELSE | 150 TRON | 151 TROFF |
| 152 DEFSTR | 153 DEFINT | 154 DEFNG | 155 DEFDBL |
| 156 LINE | 157 EDIT | 158 ERROR | 159 RESUME |
| 160 OUT | 161 ON | 162 OPEN | 163 FIELD |
| 164 GET | 165 PUT | 166 CLOSE | 167 LOAD |
| 168 MERGE | 169 NAME | 170 KILL | 171 LSET |
| 172 RSET | 173 SAVE | 174 SYSTEM | 175 LPRINT |
| 176 DEF | 177 POKE | 178 PRINT | 179 CONT |
| 180 LIST | 181 LLIST | 182 DELETE | 183 AUTO |
| 184 CLEAR | 185 CLOAD | 186 CSAVE | 187 NEW |
| 188 TAB(| 189 TO | 190 FN | 191 USING |
| 192 VARPTR | 193 USR | 194 ERL | 195 ERR |
| 196 STRING\$ | 197 INSTR | 198 POINT | 199 TIMES |
| 200 MEM | 201 INKEY\$ | 202 THEN | 203 NOT |
| 204 STEP | 205 + | 206 - | 207 * |
| 208 / | 209 [| 210 AND | 211 OR |
| 212 > | 213 = | 214 < | 215 SGN |
| 216 INT | 217 ABS | 218 FRE | 219 INP |
| 220 POS | 221 SQR | 222 RND | 223 LOG |
| 224 EXP | 225 COS | 226 SIN | 227 TAN |
| 228 ATN | 229 PEEK | 230 CVI | 231 CVS |
| 232 CVD | 233 EOF | 234 LOC | 235 LOF |
| 236 MKI\$ | 237 MKS\$ | 238 MKD\$ | 239 CINT |
| 240 CSNG | 241 CDBL | 242 FIX | 243 LEN |
| 244 STR\$ | 245 VAL | 246 ASC | 247 CHR\$ |
| 248 LEFT\$ | 249 RIGHT\$ | 250 MID\$ | |

Table 1. Table created using Program Listing 3. All information is stored in the ROM in a more compact manner.

"The program is a Road Race game in which you must drive a car down a winding road filled with potholes."

| | |
|-------|-------|
| 16526 | USR |
| 16732 | DEF |
| 16756 | CMD |
| 16762 | OPEN |
| 16765 | FIELD |
| 16768 | GET |
| 16771 | PUT |
| 16774 | CLOSE |
| 16777 | LOAD |
| 16780 | MERGE |
| 16783 | NAME |
| 16786 | KILL |
| 16792 | LSET |
| 16795 | RSET |
| 16801 | SAVE |
| 16804 | LINE |

Table 2. Numerical listing of disk commands which can be used in a manner similar to USR calls. The address in front of the word is the location to POKE the address of your machine language routine.

eo display scrolls. To fix this, you have to turn the monitor upside down or write a machine language routine which moves the contents of the screen down instead of up. I prefer the second choice, since the first might damage the monitor.

The machine language routine is fairly simple, it uses only 27 bytes of memory. You don't need an assembler, since the BASIC program POKES the program into high memory. The first thing the program does is to use the alternate register. Evidently, the interpreter uses some of the registers, and if you don't save them with a PUSH or an EXX, some strange and funny things will result. Next, the program moves the top fifteen lines of the video down one line. It then

| | |
|-------|-------|
| CLOSE | 16774 |
| CMD | 16756 |
| DEF | 16732 |
| FIELD | 16765 |
| GET | 16768 |
| KILL | 16786 |
| LINE | 16804 |
| LOAD | 16777 |
| LSET | 16792 |
| MERGE | 16780 |
| NAME | 16783 |
| OPEN | 16762 |
| PUT | 16771 |
| RSET | 16795 |
| SAVE | 16801 |
| USR | 16526 |

Table 3. Disk commands. Same as Table 2 except in alphabetical order.

```
10 REM PROGRAM NO. 3      TABLE OF RESERVED WORDS
20 N=128:PRINT,,,
30 FOR A=5712TO6175
40 C=PEEK(A)
50 IFC>128THEN PRINT,N;" ";CHR$(C-128);:N=N+1:NEXTA:END
60 PRINTCHR$(C);:NEXTA
```

Program Listing 3

```
100 REM PROGRAM NO. 4      ROAD RACE DEMONSTRATION
200 CLS:INPUT"DID YOU SET MEMORY SIZE TO 32741";Z$
300 IF LEFT$(Z$,1)="N"THENEND
400 CLS:PRINT@475,"ROAD RACE"
500 CLEAR100
600 DATA 217,17,255,63,33,191,63,1,192,3,237,184,33,0,6
700 DATA 17,1,60,1,63,0,54,32,237,176,217,201
800 DATA 2608 : REM THIS IS THE SUM OF THE PREVIOUS DA
900 FOR A=0TO26 : READ C : S=S+C : POKE 32741+A,C: NEXT
1000 READ C :IF S<>C THEN PRINT"DATA INVALID. END OF RU
1100 POKE16804,229:POKE16805,127
1200 PRINT:PRINT:PRINT"DO YOU WANT INSTRUCTIONS (Y/N) ?
1300 Z$=INKEY$:IFZ$="N"THEN2400ELSEIFZ$="Y"THEN1400ELSE
1400 CLS:PRINTTAB(24)"*** ROAD RACE ***"
1500 PRINT:PRINT"THIS IS A SIMPLE ROAD RACE GAME."
1600 PRINT"THE OBJECT IS TO DRIVE YOUR CAR DOWN A WINDI
1700 PRINT"HOWEVER, THIS IS NOT VERY EASY BECAUSE THE R
1800 PRINT"CONDITION. YOUR CAR WILL LOOK LIKE THIS (
1900 PRINT"BE CONTROLLED WITH THE LEFT AND RIGHT ARROW K
2000 PRINT"WHEN YOU HIT THE SIDE OR ONE OF THE POTHOLE
2100 PRINT"BASED ON THE LENGTH OF YOUR RACE. MY RECORD
2200 PRINT:PRINT:PRINT:PRINT
2300 INPUT"PRESS THE ENTER KEY TO BEGIN";Z$
2400 CLS
2500 L=16353
2600 Z=0:T=0
2700 X=X+RND(0)/7
2800 T=T+1
2900 Z=Z+.05
3000 Y=SIN(X)*19+22
3100 W=SIN(Z)*5+15 : REM W = WIDTH OF TRACK
3200 PRINT@0,STRING$(Y,146);STRING$(W,32);STRING$(63-W-
Y,146);
```


"The main purpose of this program was to demonstrate how to use the disk commands, so there are few features in the game."

```

3300 POKERND(60)+15360,128+RND(63)
3400 POKERND(60)+15360,32
3500 P=PEEK(15168)
3600 IFP=32THENL=L-2
3700 IFP=64THENL=L+2
3800 LINE
3900 IFPEEK(L-1)>128ORPEEK(L)>128 OR PEEK(L+1)>128THENG
OTO4200
4000 POKEL-1,58:POKEL,73:POKEL+1,58
4100 GOTO2700
4200 FORQ=1TO9:FORW=1TO30:NEXTW:PRINTCHR$(23);:FORW=1TO
30:NEXTW
4300 PRINTCHR$(28);:NEXTQ
4400 CLS:PRINTCHR$(23)" COLLISION":PRINT:PRINT
4500 PRINT"SCORE":T
4600 IFT>HSTHENHS=T
4700 PRINT"HIGH":HS
4800 G=G+1:TS=TS+T
4900 PRINT"AVERAGE":INT(TS/G)
5000 PRINT:PRINT
5100 PRINT"PLAY AGAIN (Y/N) ?"
5200 Z$=INKEY$:IFZ$="N"THEN5300:ELSEIFZ$="Y"THEN2400:EL
SE5200
5300 CLS:END

```

Program Listing 4

fills the top line with spaces, gets the old registers back, and returns to the BASIC program. A return is used because the interpreter PUSHes the return address onto the stack before it jumps to our routine.

MEMORY SIZE 32741

First enter 32741 to the memory size

question. Then type SYSTEM followed by /0. This should bring the memory size.

When you RUN the program, it will ask whether you set the memory size. If you did, press enter. The next section of the program reads in data for the machine language and POKes it into memory. If also adds up all the data and compares it to a

pre-determined sum. If the sums do not match, you blew it when you typed in the program, and it tells you so. This is a valuable feature; it keeps you from losing the entire program because of a common keyboard bounce.

Line 1100 is the one that enables our disk command. It POKes the entry point of our machine language routine into the line address. Now, whenever you type LINE, even if you type new and erase the program, the contents of the screen will move one line down.

Lines 1200-2300 provide some simple instructions. The car is maneuvered by using the two arrow keys. I use the PEEK command to see if a key is down rather than INKEY\$ because INKEY\$ does not repeat if the key is held down. Table 4 shows the address to PEEK at for each key. For example, to detect whether the left arrow key is down, PEEK at location 15168. If bit 5 is on, or the value is 32, then the key is down.

Table 4 was formulated using a modified version of Program Listing 1. I changed the program so that it would continuously display the contents of memory from 14336-15359, which is the TRS-80 keyboard memory. If no keys are down, the entire block will contain zeros. Whenever any single key is pressed, a certain bit in a specific pattern of addresses comes on. For example, the A key should cause all add-numbered addresses in the keyboard memory to equal two, which is the value of bit one.

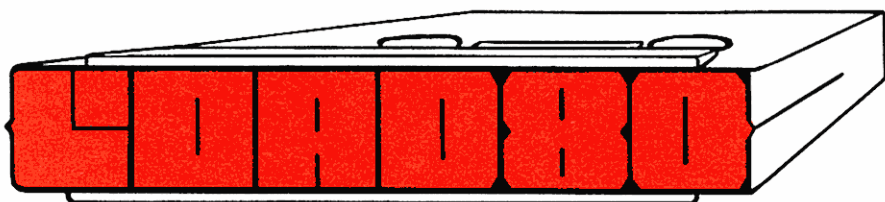
```

00100 ; MACHINE LANGUAGE ROUTINE TO MOVE SCREEN DOWN
7FE5 00110 ORG 32741 ;START HIGH MEMORY
7FE5 D9 00120 START EXX ;USE ALTERNATE REG'S
7FE6 11FF3F 00130 LD DE,16383 ;BOTTOM OF VIDEO
7FE9 21BF3F 00140 LD HL,16319 ;ONE LINE ABOVE
7FEC 01C003 00150 LD BC,960 ;BYTES TO MOVE
7FEF EDB8 00160 LDDR ;MOVE IT DOWN
00170 ;CLEAR FIRST LINE
7FF1 21003C 00180 LD HL,15360 ;START OF LINE
7FF4 11013C 00190 LD DE,15361 ;NEXT CHARACTER
7FF7 013F00 00200 LD BC,63 ;LENGTH OF LINE
7FFA 3620 00210 LD (HL),32 ;SPACE IN FIRST CHAR
7FFC EDB0 00220 LDIR ;CLEAR LINE
7FFE D9 00230 EXX ;GET OLD REGISTERS
7FFF C9 00240 RET
7FE5 00250 END START
00000 TOTAL ERRORS

```

Machine Language Listing

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314B8

"The machine language routine is fairly simple, it uses only 27 bytes of memory."

When more than one key is pressed simultaneously, the patterns will overlap and some addresses will contain the value of one key, some will contain the value of the other key, some will contain the value of both keys combined, and the rest will con-

table does not work perfectly; some combinations of keys affect other bits. Under normal use this peculiarity never causes problems.

There is also another set of memory locations which operate identically to this set,

| MEMORY | BIT | | | | | | | |
|--------|-------|-------|-------|---|---|---|---|-------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 15105 | @ | A | B | C | D | E | F | G |
| 15106 | H | I | J | K | L | M | N | O |
| 15108 | P | Q | R | S | T | U | V | W |
| 15112 | X | Y | Z | | | | | |
| 15120 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 15136 | 8 | 9 | : | ; | , | - | . | / |
| 15168 | ENTER | CLEAR | BREAK | ↑ | ↓ | ← | → | SPACE |
| 15232 | SHIFT | | | | | | | |

Table 4. Table of memory locations and bits used to sense depressed keys.

tain zero. I created the table in Table 4 by carefully noting the few addresses where the patterns do not overlap, in which there is only one key which can affect a specific bit in a certain memory location. If many keys are pressed down simultaneously, the

which start at 14337. I have always used the second set; both sets operate identically, and so I offer the table my program uses.

Back on the Road

The following describes how I made the

road curve and shrink. L is the location of the car, which I put in the center so that no one can race off the edge of the screen and drive through reserved RAM. I could have put a wall along the side, but it was easier to put the car in the center and let it get smashed by the rapidly approaching wall just before it reached the edge.

T is the time counter, which is incremented each time the screen is moved down. This provides a simple scoring method, by using time as the score and by letting the driver race as long as he can. X and Z are used as angles in sine functions which determine the curve and width respectively. By increasing the increments in lines 2700 and 2900, the track can be made to bend and shrink faster. By changing values in lines 2700-3100, you can observe how each number affects the shape of the road.

Line 3200 prints a string of graphics drawing the left edge of the road, followed by some spaces and another string of graphics drawing the right edge of the road. If you don't like the graphic character which I used, change the 146 to a different number. Line 3300 POKes a random graphic character into a random position on the top line. Sometimes it falls inside the road, in which case it is a pothole. Otherwise it simply adds texture to the road side. Texture is also the function of line 3400, which adds random blanks to break up the repetition.

RSGLMOD1 - \$50 - Enhancements to Radio Shack General Ledger 1.1 Special feature - Copy ONLY ONE disk for back-up security. Print features - General ledger with beginning balances; current month activity; ending balances ** Classified balance sheet. Print Options - Omit current column on income statement ** Omit account numbers on balance sheet and/or income statement. Input Display - Previous document name, number of entries/total entries permitted for current session, and dollar total of current document are always visible. These are nice anytime and just plain excellent after you return from an interruption. Input Options - Set up an "automatic" account number. Touch ENTER to use. Change to another account anytime ** Re-do a document after it is balanced (Before starting next document) ** Change document name and entry date for each entry. One possibility is a check register with only one cash entry ** Automatic credits to liability, capital, and income accounts ** Others. Supplied as program lines which must be MERGED into the original programs, or, send a disk copy of the original programs and the modifications will be installed on your diskette - no additional charge.

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The next three lines test for an arrow key and adjust the car location if a key is down.

And now: the thing we've all been waiting for: Our new LINE command, in line 3800. That one word moves the entire screen down, clears the top line, and pushes the car, which was on the bottom, of the screen. The LINE command can be put in the middle of a line or anywhere the CLS command could be used. Line 3900 looks at the three bytes forming the car, and if there is a graphic block in any of them, there must have been a collision. Line 4000 displays the car. I used a colon, followed by the letter I, followed by another colon for the car. The two dots on the colon are the wheels, and the I is the body. Finally, in the next line, the program loops back and makes the race an endless loop.

The rest of the program is the collision routine. Line 4200 makes the screen shake after a collision. It has a short time delay and then shifts the screen into expanded character mode with CHR\$(23). It again delays and then shifts the screen back to normal character size with CHR\$(28). (I bet that none of you have discovered that command yet because the manual says that a CHR\$(28) returns the cursor to display position (0,0)). The rest of the program is straight forward.

How to Enhance It

The main purpose of this program was to demonstrate how to use the disk commands, so there are few features in the game. The following are some modifications which you might like to add, to make the game interesting. The program is numbered in increments of 100 so that there is plenty of room to insert modifications.

There could be a finish line at a score of 500, and YOU HAVE WON could be displayed. Another method would be to have all races 500 time units long, start with a score of ten, and lose one point for each collision. Scoring could be enhanced by keeping track of scores for more than one person by asking for their initials at the start of each race. Another improvement would be to allow difficulty levels by changing items such as speed, width of the road, frequency and sharpness of curves, and number of potholes. The best improvement would be to write the entire program in machine language and move the screen down only one graphic block at a time instead of three.

Next month I will use the disk commands to create and print designs like the one shown with this article. ■

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Assembled: \$120

by Carl A. Kollar

I guess I don't have to tell any TRS-80 owners how frustrating the cassette system that comes with the computer can be. Even with the factory mod that's available, the annoyance of loading and checking programs becomes just barely tolerable.

If you're like me, after you've just plunked down a chunk of money for a Level II 16K machine, "you ain't got nuttin left" for even one disk drive at 500 bucks apiece. So you suffer.

A reasonable alternative is the Exatron Stringy Floppy (ESF). This will cost you about 250 bucks and totally eliminates your loading and saving problems, automatically and fast. I've had one of these for about six months and love it!

But, if the price is still too steep, have I got a device for you!

The Device

The February 1980 issue of *Microcomputing* had an ad that intrigued the hell out of me. It was a high-speed cassette system by JPC Products acclaimed as a "poor man's floppy." It made all sorts of seemingly ridiculous claims such as "loads five times faster," "stores 50,000 bytes on a 10-minute cassette," "less than one bad load in a million bytes with the volume control anywhere between one and eight."

All this for a measly [90] bucks? How could this be? A call to Albuquerque answered a few questions: Yes, it had its own power supply, and, it stored programs five times faster because it utilized higher density data. The computer outputs the information at a higher rate out of the rear keyboard connector.

The ad had even claimed anyone could build it even if you have never soldered before. JPC would make it work, if you couldn't—for free. I was sold. I placed my order, and it arrived about two months later (parts shortage).

I work in electronics, so I found the unit exceptionally easy to build. It took about an hour. The manual is superb. (That's better than great.) It was clear, concise and exact with no

[Reprint of June 1980 Review, *80 Microcomputing*]

ambiguities. Important parts placements are stressed (polarity markings on electrolytics, bands on diodes, etc.).

JPC was right! With these instructions, you couldn't go wrong. The board quality is excellent. It is double-sided and parts locations are clearly marked on the component side of the board. There are no jumper wires to install. JPC utilizes PC traces and plated-through holes for connections to traces on the other side of the board.

Also, there are absolutely no adjustments or settings to bother with.

The documentation is a sheaf of 8½ × 11 papers stapled together. It is written in the nicest format I've seen in a while. Each command and/or subjects is covered on its own sheet in large type. All explanations are in easy to read English—not computerese.

Commands and Features

SAVE "filename": Saves your BASIC program on cassette.

LOAD: Reads the next BASIC program from the cassette.

LOAD "filename": Searches for and loads the specified file from cassette.

LOAD? and LOAD? "filename": Reads file from cassette, and compares contents to memory.

LOADN: Prints a list of all the programs on a cassette, until interrupted by the "break" key.

LOADN "filename": Same as above except the tape will stop at the end of the program named.

KILL: Removes the file manager program from memory so that the extra memory can be used by large programs.

RSET: Allows the operator to rewind and position the tape on tape recorders that have these functions tied to the motor control jack.

RUN "filename": TC-8 searches for a specified program and runs it immediately.

PUT "filename": Same as SAVE "filename", except it is for use with system tapes.

GET: Same as LOAD, except it is for use with system tapes.

GET "filename": Same as LOAD "filename", except it is for use with system tapes.

GET? and GET? "filename": Same as LOAD? and LOAD? "filename", except it is for use with system tapes.

GETN and GETN "filename": Same as

LOADN and LOADN "filename", except it is for use with system tapes.

OPEN: Required before cassette input or output of a data file can be attempted.

CLOSE: Required to end a cassette data file.

PRINT#: Allows numerical or string data to be output to a cassette file.

INPUT#: Allows numerical or string data to be input from a cassette file.

I haven't counted them, so I don't know about the "one load in a million bytes" claim, but my son, Anthony (age 11), loaded about 30 of his programs from his Radio Shack format tape to a new TC-8 format tape. He's run them all and found no bad loads.

Unlike the standard tape system, you can position your tape anywhere before the program you want and not have to look for a blank spot between programs. The TC-8 patiently waits for the program you want and then starts loading without getting confused by the portion of the previous program you just fed it.

Try that on your regular cassette system; you'll wear out the reset button. ■

ORDER NOW

To order your TC-8 kit, send your check or money order for \$90.00 plus \$3.50 postage and handling to JPC PRODUCTS CO., 12021 Paisano Ct., Albuquerque, NM 87112 (New Mexico residents add 4% sales tax). Credit card orders accepted by phone or mail. Personal checks will delay shipment. We will otherwise immediately ship you the TC-8 kit, the cabinet, the ribbon cable, the power adapter, an instruction manual, and a cassette containing the software.



✓ 190

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How does 192 × 26 sound?

A High-Density Graphic Interface

Dennis Murray
CompuTech
1005 Chestnut Dr.
Christiansburg, VA 24073

Paul Fowler Jr.
Enable Electronics
2103 Charlton Lane
Radford, VA 24141

Do you have the feeling that you are drawing pictures, plots, and graphs using a paint roller for a drawing pen? How would you like an interface that provides 192 dot positions horizontally and 96 dot positions vertically? That's over 18,000 separately addressable dot locations! You can have exactly that if you build this high density graphics interface.

This is not a programmable character generator with limitations and relative software complexity. It is a legitimate, one-dot-per-bit graphics interface.

The prerequisites for the design of a high density graphics interface for the TRS-80 are size

and simplicity. Size is important to fit the circuit inside the computer case. Simplicity is important if relatively inexperienced TRS-80 owners are to install and maintain the interface. We feel that both objectives have been met due primarily to the philosophy of using as much of the ex-

television set without a tuner or intermediate frequency (IF) section. This type of monitor sweeps the screen with a dot of light starting at the top left corner of the screen and proceeding across the screen from left to right and top to bottom (Fig. 1). The term for this technique is

second to minimize flicker and ac hum.

The horizontal and vertical sweeps are generated by free-running sawtooth oscillators. The natural frequency of oscillation is slightly lower than the desired sweep (See Fig. 2). These oscillators can be re-triggered early and start a new sweep by superimposing a reset signal (called SYNC) on the video signal transmitted to the monitor. Thus, if the computer provides a SYNC signal at a repetition rate slightly faster than the horizontal oscillator's natural frequency, the monitor's sweep will be pulled into synchronization with the incoming video signal. Once synchronization is established, it is easy to determine the exact location of the monitor's light dot at any instant. By turning the dot on or off at the right time, characters or graphics can be formed on the screen. (See Fig. 3.)

The operation of a video monitor is simple. It depends on the input video signal to provide all information to display data.

Generation of the video signal becomes the responsibility of the computer. The TRS-80 ac-

"The character generator (Z29) is really nothing more than a ROM whose memory is addressed by the ASCII representation. . ."

isting (and debugged) TRS-80 video display hardware as possible, and use of 4K × 1 static RAM chips.

While this circuit should not be attempted by those with no hardware experience, it shouldn't be a difficult task.

Video Monitor Concepts

The TRS-80 monitor is really nothing more than a modified

raster scan. A complete scan of the whole screen is called a frame and is composed of 264 lines. All 264 scan lines are not available for display, however, because approximately 72 are needed to provide proper margins for top and bottom and time for vertical retrace. This leaves 192 scan lines to display information. The screen is refreshed at a rate of 60 frames a

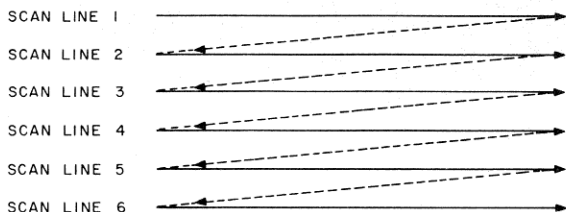


Fig. 1. Raster Scan. Arrows indicate display portion of scan. Dashed lines indicate blanked retrace.

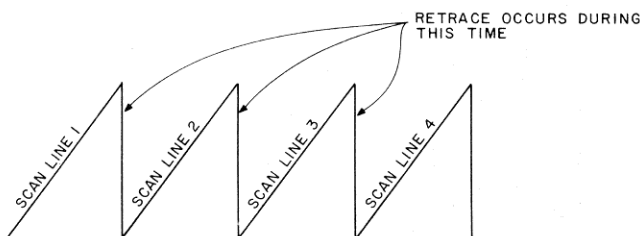


Fig. 2. This is an example of a signal generation by a monitor's horizontal output stage. Retrace occurs during the sharp vertical lines between scans.

completes this with a specialized section of hardware.

TRS-80 Video Text Generation

This section is to familiarize the reader with the concepts of text generation as they apply to the TRS-80. A detailed description of the TRS-80 operation is also available from Radio Shack in a booklet entitled "TRS-80 Microcomputer Technical Reference Handbook."

Fig. 4 is a functional block diagram of the video display circuitry. For simplicity, only the 64 character-per-line mode will be presented.

The video clock generator is driven by the TRS-80 system clock and generates the three most critical clocks of the circuit: SHIFT, CHAIN, and LATCH. It is the responsibility of SHIFT to inform shift register Z10 and Z11 when to output the next dot. Its frequency is determined by the rate at which the dots are to be displayed; in this case, SHIFT operates at 10.6445 Megahertz.

CHAIN serves the dual purpose of driving the address counters and serving as the low order address line for the display RAMs (Z45-48, Z61-63). Note that for every complete cycle of CHAIN, two different locations are addressed: one is referenced when CHAIN is at logic

0 and another when CHAIN is at a logic 1. Thus, CHAIN would operate at a frequency equal to one-half the rate at which memory addresses change. Since the TRS-80 uses a five-by-seven dot matrix for character display and requires one "undot" (black dot) to separate characters horizontally, we need six dots per character. This means we must increment memory locations once every six dots and CHAIN must be one-half of that speed. Thus, CHAIN operates at a frequency of 887 kHz (SHIFT dot rate of 10.6445 MHz \div 6 dots/character \div 2 = 887 kHz).

The function of LATCH is to provide enough delay so that the RAM and character generator output can stabilize, and then load the shift register with that output (Fig. 5). Therefore, LATCH must operate at the rate characters are to be output to the screen, which is one-sixth of the dot rate, or 1.774 MHz.

The video RAM is addressed by the video refresh counters made up of Z65, Z50, Z12, and Z32. The counters provide a means of sequentially accessing memory while simultaneously producing horizontal and vertical sync. Integrated circuits Z65 and Z50 comprise a divide-by-32 counter that, when coupled to CHAIN, provides the low-

order six address lines for the video RAM. The result is a maximum addressing range of 64 sequential locations, which happens to be the number of characters on a line. The last counter stage of Z50 is configured to provide a horizontal sync pulse and sufficient delay time to allow horizontal retrace blanking on the monitor.

A total of 12 scan lines is required to display one text (or graphics) line for the TRS-80. (See Fig. 3.) This means that once a horizontal scan is complete, we must re-address those character locations 11 more times before moving on to new text. This function is handled by Z12. Once Z12 has counted through 12 scan lines, it provides an output pulse to the text line counter made up of part of Z65 and Z32.

The text line counter serves two purposes: It provides a divide-by-16 counter to drive the high-order video RAM address lines and it provides a vertical retrace blanking for the monitor.

The insertion of four-bit multiplexors (Z64, Z49, and Z31) between the video refresh counters and the video RAM allows the system to access that RAM

in order to read or change its contents.

The source of the video RAM's address is switched from the video refresh counter to the system address bus when VID* is pulled low. When this happens, the data output from the RAMs will not necessarily be valid for video display. Therefore, VID* sets a flip-flop (Z7) to ensure that the video display is blanked during that portion of the horizontal sweep disturbed by the CPU's access to the video RAM.

During normal screen refresh the output from the video RAM is captured after it is stable in a six-bit latch by a signal called, appropriately, LATCH. Once latched, the RAM address is incremented so that the next location can be accessed while the present data is being processed by the character generator or the block graphics generator (Fig. 5).

The character generator (Z29) is really nothing more than a ROM whose memory is addressed by the ASCII representation of the character to be displayed and the scan line currently being displayed. Its output is five bits wide, representing the array of dots necessary to build

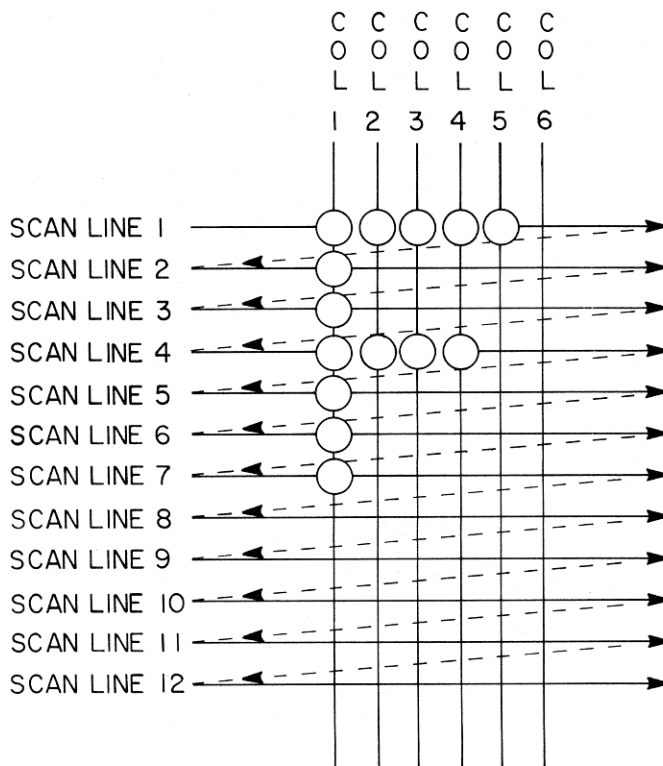


Fig. 3. Character Generation Using Raster Scan

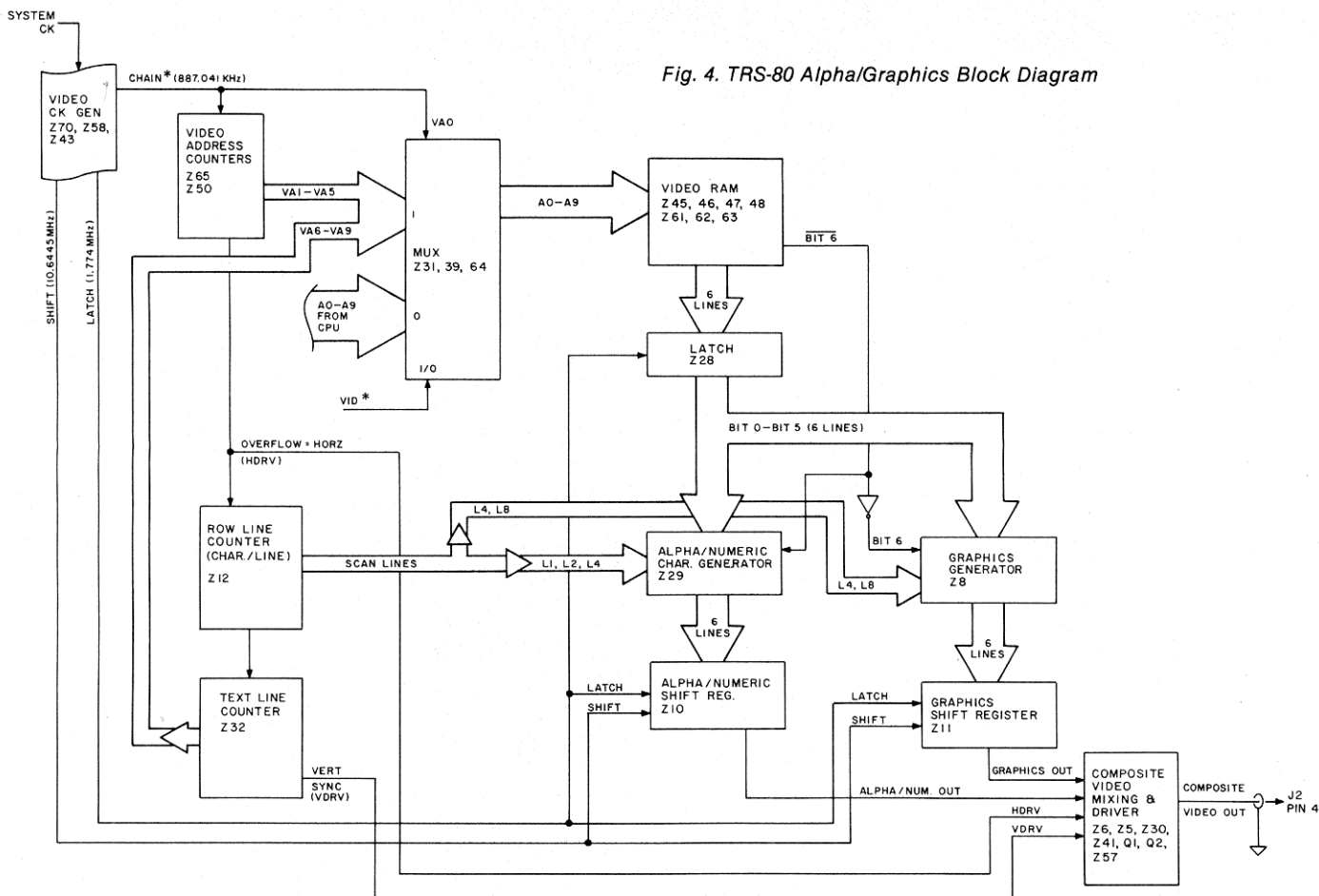


Fig. 4. TRS-80 Alpha/Graphics Block Diagram

a video image of that character (Fig. 3). These five bits are then fed to a shift register where a blank bit is added. The final six bits are shifted out, one bit at a time, to a video driver section where each is mixed with the horizontal and vertical sync signals, amplified, and matched to the impedance of the monitor (75Ω). The resulting signal, called composite video, is presented on J2 for connection to the video monitor.

The graphics generator is composed of a four-line to one-line multiplexer (Z8) and a shift register (Z11). The multiplexer routes two of the six data bits present on its input to its two output lines. Which input bits are selected is determined by the A and B inputs to the multiplexer. These inputs are driven by the two most significant bits of the scan line counter (Z12).

Since Z12 is configured as a divide-by 12, the information supplied to the A and B inputs will change on every fourth scan line. Thus, each pair of bits se-

lected by multiplexer Z8 will be held for four scan lines, then another pair is picked. When all 12 scan lines for a character row have been completed, the multiplexer will have supplied three pairs of bits, thus the vertical stacking of three graphics

two blocks wide and three blocks deep.

If the graphics mode is indicated for the character, Z63 will output a logic 1. This will result in the multiplexer's block graphics being loaded into shift register Z11 instead of the charac-

"The prerequisites for the design of a high density graphics interface for the TRS-80 are size and simplicity."

blocks per character row.

The multiplexer's output pair is presented to shift register Z11, which is wired so that each bit represents a total of three dots. Since each character position is six dots wide, this technique will cause the monitor to display two blocks of dots, horizontally, for each character location. The result is a form of graphics where each character position is divided into a matrix

ter generator loading its data into shift register Z10. Z11 will then shift its dots out, one at a time, to the video driver section. There it is mixed with the horizontal and vertical sync signals, amplified, and sent to plug J2 as composite video.

High-Density Graphics Interface

During the design of the interface, a compromise had to be reached between adequate

screen resolution and excessive memory consumption. The final decision was that the ability to resolve and display screen positions down to the size of the normal TRS-80 period would provide sufficient detail. This is, in reality, a small square two dots high and two dots wide.

The TRS-80 outputs a character block six dots wide by 12 dots high when operating in the 64 character/line mode. This translates to a total of 384 dots horizontally by 192 dots vertically. Thus, if a period is a small box two dots by two dots, we can display 192 dots horizontally and 96 dots vertically. That is 18,432 discrete, separately addressable positions.

In order to use as many of the TRS-80 provided signals as possible, the high-density interface should use a similar data latch and address update scheme. Use of the TRS-80 signals such as BLANK, LATCH, Dot 2, SHIFT/LOAD, and SHIFT simplifies the design of such an interface and provides a means of synchroniz-

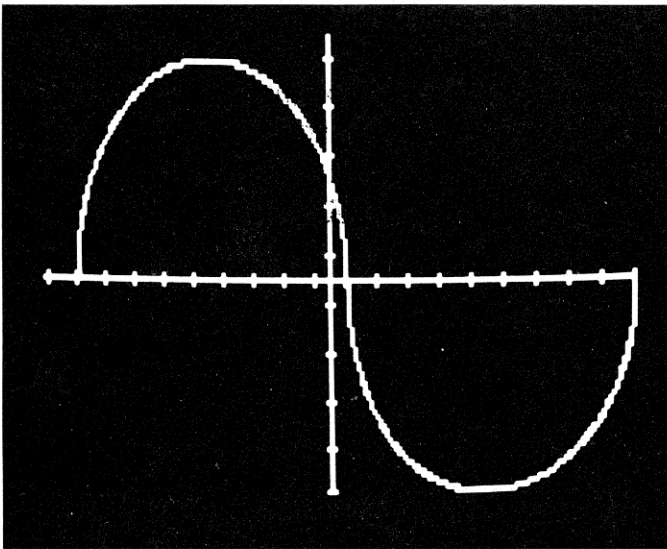


Photo 1. HR-1 High Resolution Graphics

ing the normal TRS-80 alphanumeric mode and the high-density graphics mode on a character-by-character basis without loss of synchronization. This feature is a requirement if graphic titling, legends, etc. are to be used.

Interface Operation

TRS-80 signals BLANK and LATCH are input to a 74LS74 D-flop (IC1). The output from IC1 will then indicate when a retrace (either horizontal or vertical) is taking place. The output is also used as a switch to reset the column address registers and to inhibit an undesired clock pulse present from Dot 2 immediately after the end of retrace blanking.

The Q output from IC1 and the input from Dot 2 are ANDed together in IC17b and inverted by IC16a to provide an input clock to the column address registers, IC2 and IC10. Therefore the column address registers can only be updated during a horizontal scan and not during retrace.

The high-density graphics memory is made up of six 4K × 1 bit static RAM chips organized as thirty-two six-bit bytes per line, 96 lines deep, with each bit representing a displayable box two dots square. Since Dot 2 will provide a clock pulse once every six dots and we want to display 12 dots per byte, Dot 2 must be divided by two before it can be used. That is the function of

IC2a. The output of IC2a is used as the input clock to a divide-by-32 column address counter made up of IC2b and IC10b. It is also used as a bank select to determine which half of the divided memory is accessed—the high-order three bits or the low order three bits of a byte.

Assuming the high-density graphics interface is not being addressed by CPU the MEMORY SELECT will be low, and the BANK SELECT will work as follows:

- When BANK SELECT is low, both inputs to IC16d will be low, resulting in a high input level to the chip enable inputs (\overline{CE}) of IC7, IC8, and IC9. These memory

sees a low logic level on both its inputs it will output a high logic level to the chip enable inputs of IC4, IC5, and IC6, thus deselecting them.

- BANK SELECT is initially low following a horizontal retrace due to the reset signal from IC1. Upon the next Dot 2 negative edge, BANK SELECT will toggle high; thus the alternate bank is selected. Therefore, BANK SELECT will operate at a frequency equal to Dot 2 ÷ 2 throughout the horizontal scan, at which point a retrace resets the counters.

The task of maintaining the proper row scan line address is handled by IC13 configured as a

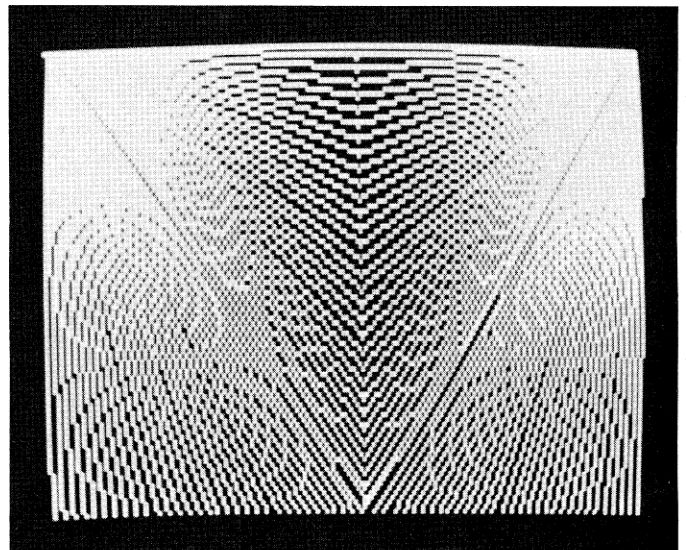


Photo 3. ALIEN Generated by HR-1

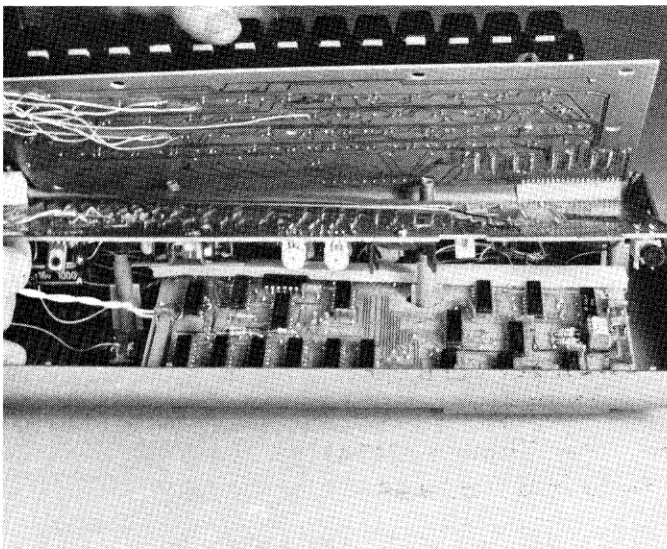


Photo 2. HR-1 Circuit Board Installed in TRS-80

chips are then effectively disabled. IC16b inverts the BANK SELECT signal and feeds it to IC16c, whose output will then go low. Thus, IC4, IC5, and IC6, representing the leftmost three bits of a byte, will receive a low on their \overline{CE} line and will be selected.

- Upon receipt of another Dot 2 pulse, BANK SELECT will toggle, going high. When this happens IC16d will see a high level on one of its inputs and give a corresponding low output to the chip enable (\overline{CE}) input of IC7, IC8, and IC9. These RAM chips will thus be selected and will output the rightmost three bits of a byte. IC16b inverts the BANK SELECT signal and feeds it to IC16c. Since IC16c now

divide-by-two counter followed by a divide-by-96 counter. The output from the divide-by-two counter is ignored (IC13 pin 3) with the remaining seven counter outputs serving as the high-order seven RAM address lines for video refresh.

The counter is configured as a divide-by-128 counter which is reset on the 96th count. IC13 gets its input from the TRS-80 signal HDRV. HDRV occurs once for every scan line at the start of horizontal retrace, thus providing sufficient time for the RAM to stabilize on the new address.

The TRS-80 signal VDRV is used to synchronize the horizontal scan line counter with the

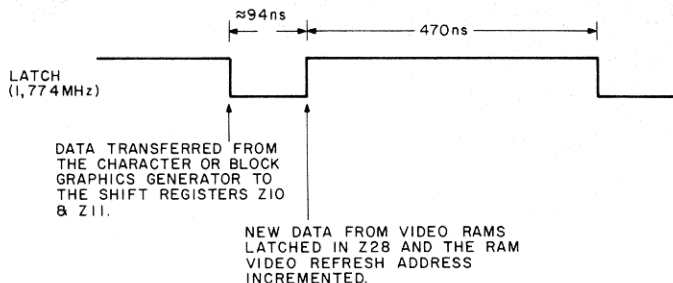


Fig. 5.

TRS-80 by resetting IC13 at the beginning of a vertical retrace. IC2, IC10, and IC13, therefore, provide all RAM addressing necessary to accomplish screen refresh.

In order to be useful, the RAM must be accessible not only by the screen address counters, but by the CPU address bus as well if data is to be read and written there. This is accomplished through the use of three four-bit multiplexers (ICs 3, 19, and 14) whose select line is driven by a four-bit comparator (IC12). IC12 compares the CPU address lines A12 through A15 against

the setting of a four-position DIP switch. The DIP switch is set to represent the desired memory location for the high density graphics RAM. When IC12 finds a match between the DIP switch setting and the CPU's address line, it pulls MEMORY SELECT high. MEMORY SELECT high causes several things to happen:

- The output of the four-bit multiplexers (ICs 3, 19 and 14) will now reflect the address present on the CPU's address bus rather than the default condition of the screen refresh address.
- Both \overline{CE} NOR gates (IC16c

and IC16d) will give a low output, thus reflecting all six data bits as a complete byte.

● Pins 1 and 12 of IC15 (IC15a and IC15d) will be HIGH. If this is a READ command \overline{WR} will be high, resulting in a LOW output from IC15a since both its inputs are now HIGH. At the same time, IC15d will output a HIGH since \overline{WR} is inverted by IC15b resulting in a low condition to pin 13 of IC15. \overline{WE} on all RAM chips will thus be HIGH, indicating a READ. All six RAMs will output their data (referenced by the CPU address bus) to a hex buffer (IC11) which is now enabled since its enable lines are drawn LOW by IC15a. These data bits will then appear on the CPU's data bus as D0 through D5.

● If the command is a WRITE, the effect is reversed. \overline{WR} is now low with the result that IC15a will output a HIGH since both its inputs are not HIGH and IC15d will output a LOW since both its inputs are HIGH (\overline{WR} was inverted prior to input to IC15d). The LOW output of IC15d will pull

the \overline{WE} line of all RAMs low, resulting in the data present on the CPU's data bus to be written in the location specified by the CPU's address bus. IC11 will not be enabled since it sees a HIGH on its enable line from IC15a, thereby preventing a conflict on the data bus.

● IC15c will clear the shift register (IC18), resulting in the output of black dots for the duration of the access. Since the RAM is presently being addressed by the CPU rather than the screen refresh circuit, the data output by the RAMs will not be correct and therefore should not be shown on the screen.

During normal screen refresh the RAM's \overline{WE} is held HIGH (indicating a READ) since MEMORY SELECT is low. BANK SELECT will determine which half of a RAM data location is output to the shift register (IC18). AND gates IC17a, c, and d effectively route the selected RAM data to the shift register. The left bit of each half goes to IC17d, the next bit of each half to IC17c, and the

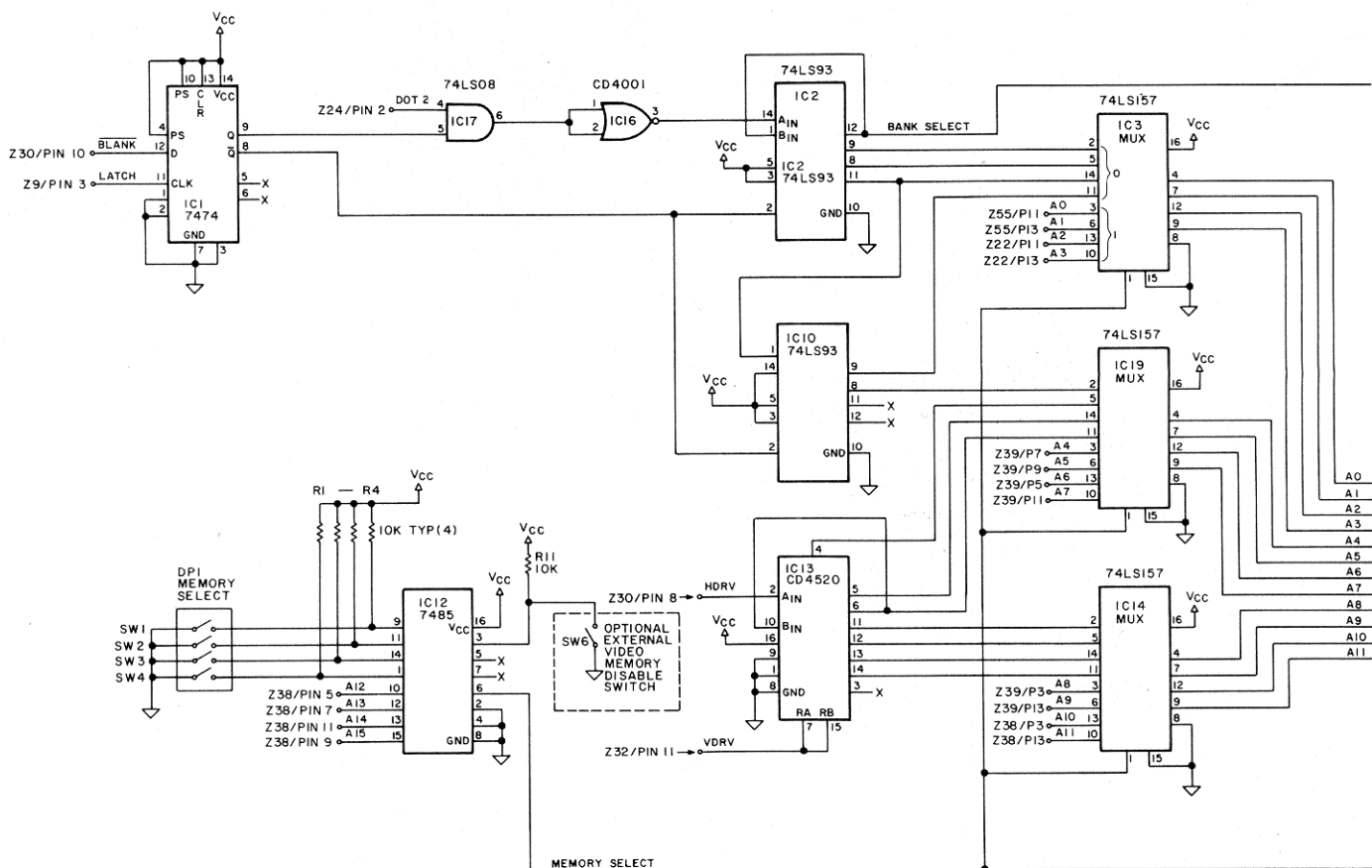
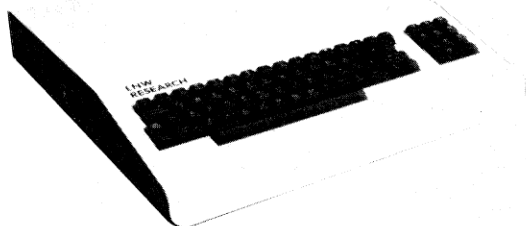


Fig. 6. Schematic of High Resolution Graphics Interface.

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| TRS80 MODEL I LEVEL II COMPATIBLE | YES | YES | NO |
| 48K BYTES RAM | YES | YES | YES |
| CASSETTE BAUD RATE | 500/1000 | 500 | 500/1500 |
| FLOPPY DISK CONTROLLER | SINGLE/DOUBLE | SINGLE | SINGLE/DOUBLE |
| SERIAL RS232 PORT | YES | YES | YES |
| PRINTER PORT | YES | YES | YES |
| REAL TIME CLOCK | YES | YES | YES |
| 24 X 80 CHARACTERS | YES | NO | NO |
| VIDEO MONITOR | YES | YES | YES |
| UPPER AND LOWER CASE | YES | OPTIONAL | YES |
| REVERSE VIDEO | YES | NO | NO |
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| NUMERIC KEY PAD | YES | NO | YES |
| B/W GRAPHICS, 128 X 48 | YES | YES | YES |
| HI-RESOLUTION B/W GRAPHICS, 480 X 192 | YES | NO | NO |
| HI-RESOLUTION COLOR GRAPHICS (NTSC), 128 X 192 IN 8 COLORS | YES | NO | NO |
| HI-RESOLUTION COLOR GRAPHICS (RGB), 384 X 192 IN 8 COLORS | OPTIONAL | NO | NO |
| WARRANTY | 6 MONTHS | 90 DAYS | 90 DAYS |
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right bit of each half goes to IC17a.

Since one-half of the RAMs will be tri-stated (due to a HIGH on their respective \overline{CE} line) the pull-up resistors will pull those data lines high. As can be seen by the schematic, this means that one input to each AND gate will always be high. The output of these AND gates will then reflect the state of the other input line, which is driven by the selected RAM chips. The output of IC17d contains the most significant bit to be output. This bit is the first to be displayed and is, therefore, wired to the first two-bit locations of the output shift register.

IC17c contains the next most significant bit so it is wired to the next two locations to be shifted out. IC17a contains the least significant bit so it is wired to the fifth and sixth bits to be shifted. The remaining two bits of the shift register are not used so they can be ignored.

By wiring each data bit to two shift register bits, each data bit will be present on the shift register output line for two shift pulses. Therefore, each data bit will be displayed on the screen two dots wide.

Control for the shift register

er TRS-80 generated signal used to inform the shift register when to load new data from IC1 and when to allow shifting of dots to VIDEO OUT;

●SHIFT and SHIFT/LOAD were referenced earlier under the description of the TRS-80 Video

normal TRS-80 block graphics mode is selected or the high density video graphics mode is enabled.

Summary

This article should provide the reader with an understanding of raster scan video display concepts as they apply to the TRS-80, and offers an alternative high density graphics interface that can be built at a reasonable cost. The quality of the graphics available with the interface allows the user to achieve a level of display sophistication not presently attainable with a TRS-80.

The second section of this article addresses construction and installation of the interface and driving software to make this a viable package. A complete printed circuit board of the interface designed to be installed inside the TRS-80 console is available for \$26 from the authors.■

"This article should provide the reader with an understanding of raster scan video display concepts as they apply to the TRS-80. . ."

comes from three locations:

- MEMORY SELECT (IC15c), which has already been described;
- SHIFT, which is a TRS-80 generated signal used to inform the shift register when to output the next video dot;
- SHIFT/LOAD, which is another

Text Generation.

The output from the shift register is called VIDEO OUT and goes to a switch (SW5) which has been inserted in the TRS-80 line called GRAPHIC between TRS-80 Z11 pin 13 and TRS-80 Z30 pin 2. The position of this switch determines whether the

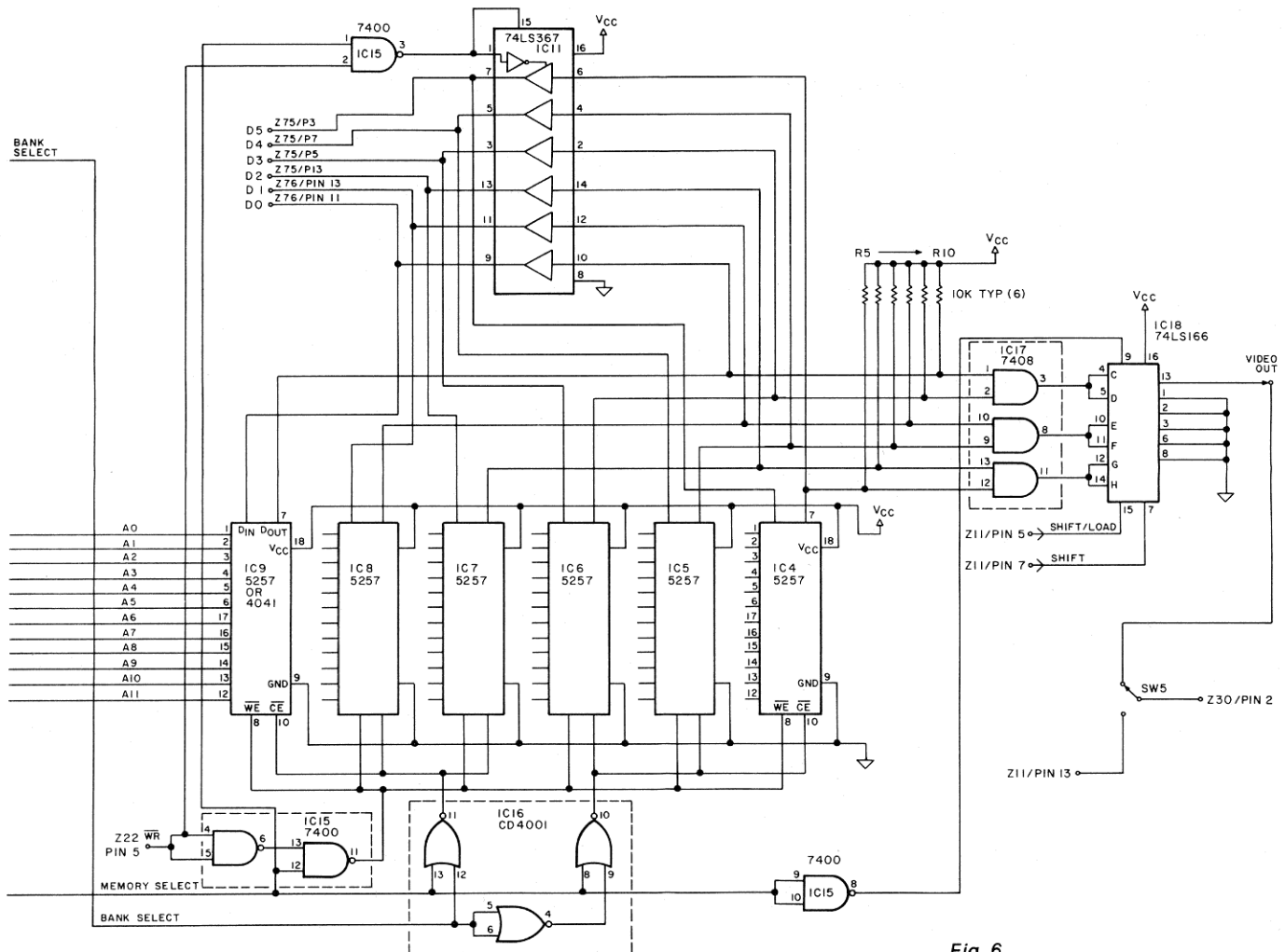
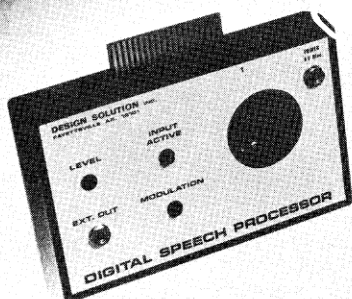


Fig. 6.

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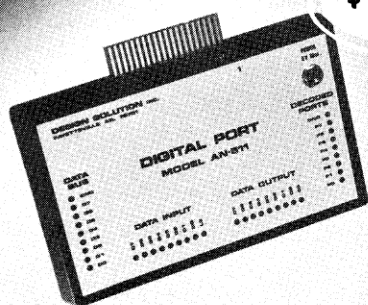
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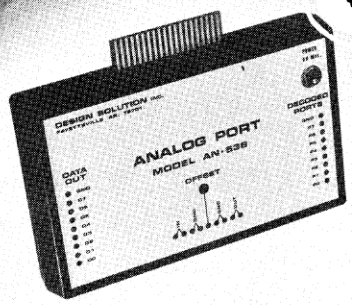
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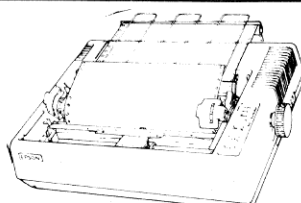
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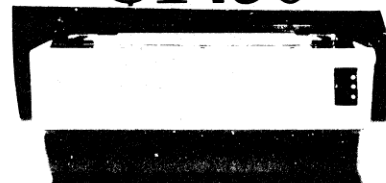
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More hints and kinks for educational software authors.

Programming for Education—Part 3

Jerome I. Weintraub
690 Mtn. View Rd.
El Cajon, CA 92021

All educational programs are either teaching or testing programs. While it may be obvious that a teaching program teaches and a testing program tests, there seems to be a belief that testing programs also teach. Unless the program is actually a combined program, it is not possible to teach by testing.

There is also a theory that if you administer the same test twice to the same students they will do better the second time, because they remember the answers. I find it difficult to accept this theory. Unless a student looks up the answers to the questions in the interim, he has no better chance to get the answer correct the second time than he did the first, even if he can remember how he answered it. I recommend that you do not deliberately use a testing program as a teaching tool.

A program that tests can be identified by one or more of the following characteristics:

- When a student has responded to a question, the computer tells him whether his answer was right or wrong and goes on to the next question.
- If the response is correct, the program goes to the next item; if incorrect, the same item is repeated until the student responds correctly, or it is repeated a given number of times after which the correct answer is given. The program

then moves to the next item.

- In multiple choice items, the wrong answer is dropped and the item repeated until it is answered correctly.

- A testing program gives the student no help or clue as to how to find the correct answer. Listing 1 is an example of a testing program.

A teaching or instructional program can be tutorial or remedial. A tutorial program presents information to the student and asks a question to find out if the student has mastered the information. If he has, the program goes on to new information; if not, the program provides more detailed information or a simpler version of it, based completely on the nature of the student's response.

A remedial program is similar to a tutorial one, except that it usually doesn't present information in advance. When a student responds incorrectly, it provides the student with help of some sort to figure out what the answer should be.

It might break the question into simpler components: If the student cannot add a column of figures, it might present the individual addition problems that make it up. See Fig. 1, which illustrates a complete remedial program for the addition problem $79 + 62 + 34$. The equation is continually simplified to the point where the student is asked to count stars to compute the sum of a basic two addend element of the original problem.

Basic elements are defined as irreducible learning tasks. Most fields of learning are based on certain elements that must be accepted without proof, or must be memorized. Such elements are not the logical result of other elements. The alphabet, for example, cannot be logically constructed, since it is an arbitrary collection of symbols.

The only way to learn the alphabet is to memorize it. The sounds of some of the letters are based on their names and can be derived from them, but most letter sounds must be memorized as well.

Number facts like $2 + 3$ can be derived by counting; 1, 2, —3, 4, 5. But the names of the numbers and their sequence must be memorized. There is a pattern in number sequence, but it is not derived from something else. A child can learn the pattern only after he has a concept of the sequence.

A remedial program can also branch to the simpler, more basic concepts that underlie or support the concept in question. Fig. 2 shows how a program could move from a question about guide words in a dictionary through explanatory and simplified frames, ending with the alphabetical order of the letters of the alphabet.

A remedial program could give hints (Did you remember the period after the abbreviation?) or supply missing elements in increments leading up to the complete answer. If the student misspelled 'ceiling' you could ask, 'Did you remember to put the E before the I?'

A frequently used technique in remedial programs is to drill the student on an item he missed. Responding to $6 + 5$ several times in succession will more effectively help him to remember than including the problem in a program containing several different problems. The spelling program in Program Listing 2 provides drill in each word missed. The math program in Fig. 1 can be written to note which errors the child is making. After having exposed the student to several problems that follow the same pattern, the computer can determine where the child needs help. You can then give the student a different problem with the same characteristics.

"All educational programs are . . . teaching or testing . . . There seems to be a belief that testing programs also teach."

Another type of drill program presents the same information in several forms, providing separate but equal repetitions. Each of the following statements would appear on the screen individually:

Olympia is the capital of Washington.
 _____ is the capital of Washington.
 Olympia is the capital of _____.
 The capital of Washington is _____.
 What city is the capital of Washington?

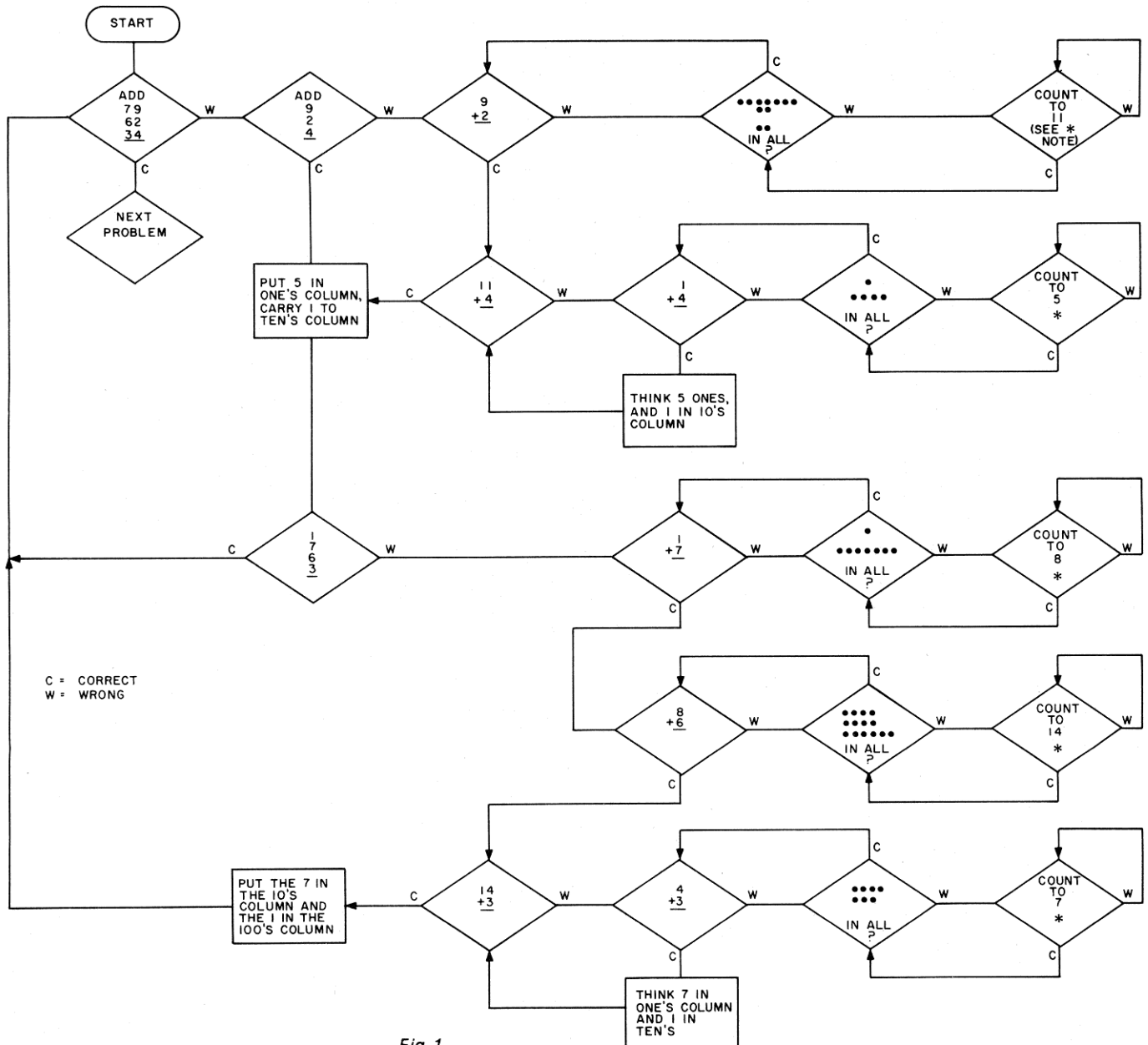
If your computer has large memory, the program can automatically place the student into a remedial program and then return him to the main program when he exhibits mastery. This kind of program must

also provide the teacher with an alert should a child make no progress after three or four tries. There are limits to the extent to which you can provide for the range of human variables that might require the attention of the teacher rather than the computer.

Testing programs are easier to write than teaching programs. A well-written teaching program can help a student move rapidly through a field that he understands easily. Correctly answered key questions may serve as evidence that this particular student does not need extensive details in order to master the objective of the immedi-

ate lesson. The student may then be able to skip the details until he reaches a level where he needs them.

Writing an effective teaching program requires knowledge of how students learn, knowledge of the subject in question and the elements that support the subject, and the sequence in which they should be presented in order to proceed from the simple to complex. The program must be designed to analyze errors and branch to a subroutine that presents the steps, the concepts, or the elements that the student must know in order to respond correctly to the original question. Once the student masters the ma-



terial in the subroutine, he returns to the original question and tries again. If successful, he is ready to go on to the next item.

Odds and Ends

The following are several short but important tips I would like to share with you in this section.

- Double-sized print.

One of the features of the TRS-80 best suited for educational programs is the availability of double-sized print. The command is PRINT CHR\$(23). This size is especially appropriate for younger children who usually find it difficult to read smaller print. PRINT statements must be composed carefully when using CHR\$(23), because you are limited to 32 characters per line. You will also find that CLS cancels this command, so it must be reentered in the program whenever you want to use it after a CLS. To avoid having to do this in a program where it appears several times, I suggest you place it in a subroutine, for example: CLS:PRINT CHR\$(23):RETURN.

- Punctuation, grammar, vocabulary.

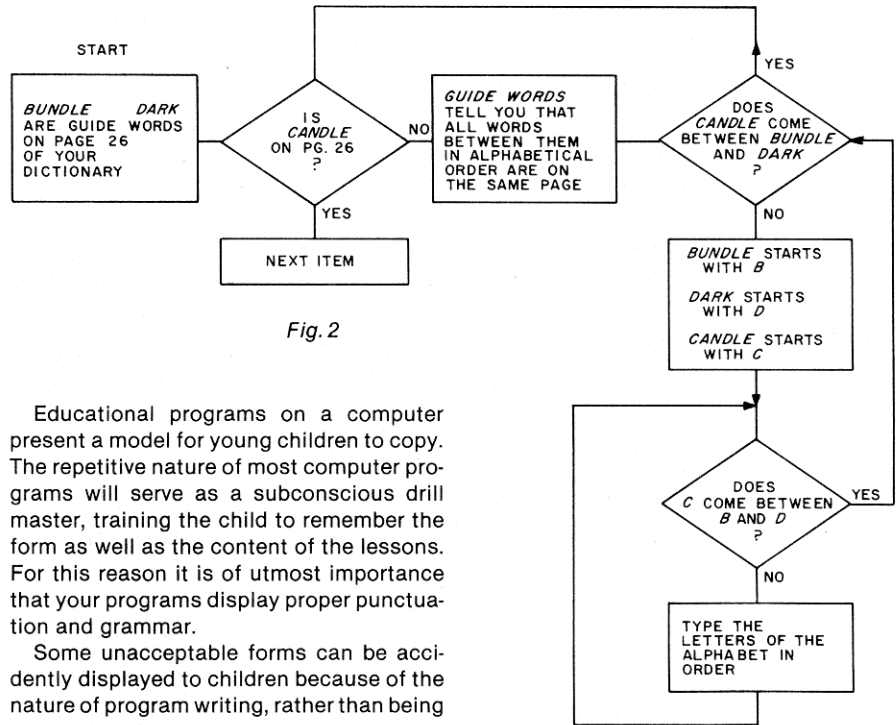


Fig. 2

Educational programs on a computer present a model for young children to copy. The repetitive nature of most computer programs will serve as a subconscious drill master, training the child to remember the form as well as the content of the lessons. For this reason it is of utmost importance that your programs display proper punctuation and grammar.

Some unacceptable forms can be accidentally displayed to children because of the nature of program writing, rather than being

```

5 'LISTING NO. 4
10 CLEAR500
15 CLS
20 PRINT"LISTING 4"
25 PRINT STRING$(63,61)
30 PRINT"THE INKEY$ FUNCTION--EXAMPLE 3"
35 PRINT:PRINT"    VARIABLE LENGTH WORDS"
40 PRINT STRING$(63,61)
45 PRINT"PRESS <ENTER> TO BEGIN.":INPUT A$
50 I=0:J=0
55 FOR I=1 TO 5
60 READ Q$(I),A$(I)
65 NEXT I
70 B1$="":X=0:J=J+1: C$=INKEY$
75 CLS
76 E=LEN(A$(J))
80 PRINT@7*64, "(";J;") ";Q$(J)
85 PRINT:PRINT"TYPE THE WORD THAT SHOULD COME FIRST"
86 PRINT"IN ALPHABETICAL ORDER."
87 FOREL=1 TO E
90 FOR X=1 TO 150
95 B$=INKEY$:IF B$=""THEN NEXT X
100 IF X>450 THEN 190
105 IF B$=CHR$(8) THEN 80
110 IF B$=CHR$(13) THEN 80
120 PRINT B$;
155 B1$=B1$+B$
160 NEXT E1
165 IF B1$<>A$(J) THEN 180
170 PRINT "    CORRECT!"
175 GOSUB 215: GOTO 70
180 PRINT "    WRONG ANSWER."
181 PRINT"THE ANSWER IS... ";A$(J);"."
185 GOSUB 215:GOTO 70
190 PRINT"    TIME'S UP!":GOSUB 215:GOTO 70
195 PRINT@7*64,"THIS IS THE END OF THE LESSON."
200 PRINT"GOOD-BYE FOR NOW."
205 PRINT"GO BACK TO YOUR CLASS.":PRINT:PRINT:PRINT:PRINT
210 FOR X=1 TO 2000: NEXT: RESTORE 'USE 9000 IN PRACTICE
211 J=0:GOTO 50
215 FOR X=1 TO 1000:NEXT
220 IF J>4 THEN 195
225 RETURN
230 DATA "COME RAIN WOOD","COME","MOTHER BIG AROUND"
235 DATA "AROUND","RUN GO SEE","GO","JUMP JULY JUNE"
240 DATA "JULY","BRING BABY BECAUSE","BABY"
  
```

Program Listing 1

merely the result of poor programming by the programmer. Some examples: Any INPUT statement on the TRS-80 will automatically be followed by a question mark. INPUT "WHAT IS YOUR NAME";N\$ will appear on the screen as, WHAT IS YOUR NAME? If you put a question mark in the input statement, INPUT"WHAT IS YOUR NAME?";N\$, you will end up with two question marks on the screen.

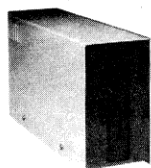
On the other hand, INPUT"PRESS ENTER" will print as PRESS ENTER? This error can be avoided by saying, PRINT "PRESS ENTER.":INPUT A\$. The question mark will then be on a line of its own, avoiding the impression that a question mark should follow a statement like 'Press enter.' Using INKEY\$ instead of INPUT avoids any question mark.

Another very common error occurs when a string variable follows a PRINT statement, such as PRINT"VERY GOOD";N\$. Most of you realize this will print as VERY GOODJOHN (no following punctuation as well as no comma or space between GOOD and JOHN). The statement must be written, PRINT"VERY GOOD, ";N\$;".", using a comma and space after good and the period after the string variable N\$.

You must keep in mind that these and other minor errors which mean nothing to an educated adult would be significant to a young elementary school child. Instructions must also be written in the vocabulary of the reader, if he is to be given the best

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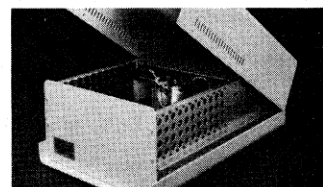
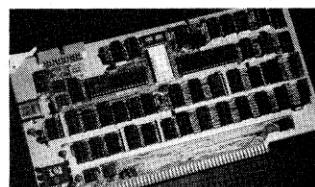
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"One secret of maintaining interest is to keep the lesson shorter than the children would like it to be."

chance to understand them. Too many times directions seem to be written as a challenge to the reader rather than a guide! If you are not already familiar with the vocabulary of the age level you are programming for, be guided by the reading and math workbook materials published by textbook publishers.

● Introductory lessons.

I have found it helpful to write a program designed to introduce young students to the TRS-80. The teacher or an aide should be present during this lesson. It covers the following points:

How to use the ENTER key—that it tells the computer we have finished our turn; now it is the computer's turn to do something. Practice using the left arrow to erase.

Provide time for the child to become familiar with the keyboard; have him type his name, the letters of the alphabet, the numbers, and compositions of his own choice. Summarize the major directions so children

ming technique rather than subject matter.

● Length of lessons.

My observation of elementary school youngsters reveals that long sessions at the computer are counter-productive. Even computer games that are intrinsically interesting cannot maintain the attention of the younger child for more than about twenty minutes. This phenomenon seems to hold true for everything they do, whether it's math or playing on the playground.

Aside from its educational content, a lesson must have two related qualities: it must be able to hold the student's interest during the lesson and be able to attract him to re-

turn to it with enthusiasm the next time. Without having to inject a lot of extrinsic enhancements, like fancy graphics or game-like contests, an easy way to achieve these objectives is to keep the lesson short enough so that the student's interest level is still high at the end of the lesson.

Unfortunately, many teachers practice the opposite technique! When the children are interested in their assigned tasks, the teacher is tempted to allow the lesson to continue in order to take advantage of the interest level. Eventually the interest level decreases, and the lesson comes to an end, but it is characteristic of human nature to remember the end rather than the beginning or the middle of an experience. There-

"Too many times directions seem to be written as a challenge to the reader rather than a guide."

will be familiar with them, such as: WHAT IS YOUR NAME? THIS IS THE END OF THE LESSONS. GO BACK TO CLASS.

Be consistent in your directions. Use the same vocabulary in all of your programs. If your computer programs are to be effective, the computer itself must be eliminated as much as possible as a roadblock to learning.

When you use the INKEY\$ function, tell children they will not have to use the ENTER key. If it is properly programmed it should not be a mechanical problem, but students may be confused by the way it works.

If your computer has the calculator keyboard, train the children to use it and the ENTER key on it.

Experiment with the use of POKE 16396,175 to disable the BREAK key. If you do use it, note that it will remain in command until you press RESET or turn the computer off.

Above all, be sensitive to the reactions of the children as they use the computer and your programs. The main reason I think my programs are successful is that I have revised them whenever I noted a child having difficulty due to computer use or program-

```
35 INPUT"HOW FAST";H1 'REPLACE THIS LINE WITH H1=7100
40 DIMAS(2800)
45 CLS:PRINT CHR$(23)
50 PRINT@6*64,"PLEASE REWIND THE CASSETTE TAPE."
55 PRINT"I'LL WAIT FOR YOU..."
60 OUT 255,255
65 FOR Z=1 TO H1:NEXT
70 OUT 255,0
75 CLS
80 PRINT CHR$(23)
85 PRINT@6*64,"TIME FOR SPELLING!"
90 PRINT:PRINT"TYPE YOUR NAME, PLEASE..."
95 INPUT ES
100 PRINT:INPUT"WHAT LESSON ARE YOU ON (1-11)";A
105 IF (A<1)OR(A>11)THEN 100
110 D=10*(A-1)+1
115 C=0:CLS:PRINT CHR$(23)
120 PRINT@6*64,"PRESS THE PLAY KEY"
125 PRINT"ON THE CASSETTE PLAYER."
130 PRINT:PRINT"PRESS ENTER WHEN YOU ARE READY.":INPUT AS
135 PRINT"TYPE THE WORD YOU HEAR"
140 PRINT"NEXT TO THE NUMBER"
145 PRINT"ON THE SCREEN."
150 N=0:F=D-1
155 FOR C=1 TO D+9
160 READ AS(C)
165 NEXT C
170 FOR E=D TO D+9:BS=""
175 F=F+1
180 OUT 255,255
185 FOR H=1 TO H1:NEXT
190 OUT 255,0
195 PRINT CHR$(23)
200 PRINT F;:INPUT BS:IF BS=""THEN 200
205 IF BS<>AS(E) THEN N=N+1:AS(N)=AS(E):GOSUB 325
210 IF N=5 THEN 270
215 NEXT E
220 PRINT"VERY GOOD, ";ES;". "
225 IF N>0 THEN 245
230 PRINT"YOU GOT A PERFECT SCORE!!!"
235 PRINT "10 OUT OF 10!!"
240 GOTO 260
245 PRINT"YOU GOT ONLY";N;"WRONG"
250 PRINT"OUT OF 10!!"
255 PRINT"STUDY...":FOR G=1 TO N:PRINTAS(G):NEXT G
260 PRINT"YOUR NEXT LESSON IS NO. ";A+1;". "
265 GOTO 285
270 CLS:PRINT CHR$(23):PRINT"THAT'S ALL FOR TODAY."
275 PRINT"STUDY...":FOR G=1 TO N:PRINTAS(G):NEXT G
280 PRINT"YOUR NEXT LESSON IS NO. ";A;". "
285 PRINT"TELL YOUR TEACHER."
290 PRINT"GOODBYE, ";ES;". "
295 FOR X=1 TO H1:NEXT
300 CLS:PRINT CHR$(23)
305 PRINT@6*64,"INSTRUCTIONS:"
310 PRINT:PRINT:PRINT"PLEASE TYPE RUN AND"
315 PRINT"PRESS <ENTER> KEY."
320 END
325 CLS:PRINT CHR$(23)
330 PRINT"THE WORD IS.....";AS(N);". "
335 PRINT:PRINT"TYPE IT ONCE"
```

program continues

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```
340 PRINT"AFter EACH ? MARK."
345 FOR L=1 TO 5:C$=""
350 INPUT C$
355 PRINT C$;:IF C$<>A$(N) PRINT" IS WRONG. TYPE ";A$(N);".":GOTO
350
360 PRINT" IS RIGHT, ";E$;"!"
365 IF L=5 PRINT"READY FOR THE NEXT WORD..."
370 NEXT L
375 RETURN
380 END
500 DATA INK,OCTOBER,BRICK,ACT,MARKET,TICKET,ARITHMETIC
505 DATA BUCKET,STRIKE,BLANKET,SUBTRACT,INSECT,SUBJECT
510 DATA ACRE,ARCTIC,DRINK,THINK,CRICKET,THICKET
515 DATA BISECT,DISSECT,TRACTOR,ATTRACTIVE,ACREAGE
520 DATA ACTIVITY,SECTION,COUNTERACT,ANTARCTIC
525 DATA PEOPLE,FRIEND,SUIT,FRUIT,BUILT,MOVIE,BUILD
530 DATA FIELD,PIECE,JUICE,POEM,CHIEF,BRUISE
535 DATA SHIELD,POETRY,BUILDING,BRUISE,SHIELDING
540 DATA WIELD,YIELD,FRIENDLY,CHIEFLY,PEACE
545 DATA FIERCE,SUITABLE,JUICY,CRUISE,HANDKERCHIEFS
550 DATA SON,MONDAY,BECOME,OVEN,MONTH,FRONT,TON
555 DATA DOZEN,BOTTOM,APRON,DOCTOR,SECOND,RIBBON
560 DATA BUTTON,COMPANY,NAPKIN,PERSON,PRISON
565 DATA PHANTOM,COMPANION,ACCUSTOM,MILLION,WEAPON
570 DATA OPINION,DIAMOND,PIGEON,REASON,POISON
575 DATA EARTH,EARLY,GREAT,LEARN,WEATHER,DEATH
580 DATA HEALTH,THREAD,BREAK,BREAKFAST,INSTEAD
585 DATA HEAVY,STEAK,PEARL,HEARD,STAKE,BRAKE
590 DATA HEAVIER,WHETHER,EARN,EARNESTLY,ENDEAVOR
595 DATA BREATHTAKING,DEAFENING,DREADFUL,STEADILY
600 END
```

Program Listing 2

fore, when the subject comes up again the next day, the interest level at the beginning of the second lesson is lower than it was at the beginning of the first.

One secret of maintaining interest is to keep the lesson shorter than the children would like it to be. When students leave the computer reluctantly and ask when their next turn is, you know your lessons are the right length. Do not be tempted to allow the children to stay longer! I keep all of my computer sessions under ten minutes. See if it works for you.

● Inputting Math Responses.

When you do a math problem (with pencil and paper) do you write the answer from left to right or from right to left? The correct answer is, 'It depends.' Look at these eight problems:

| | | | | |
|--|---|--|--|---|
| 1) $\begin{array}{r} 21 \\ + 52 \\ \hline \end{array}$ | 2) $\begin{array}{r} 493 \\ 567 \\ \hline 462 \\ 931 \end{array}$ | 3) $\begin{array}{r} 936 \\ - 489 \\ \hline \end{array}$ | 4) $\begin{array}{r} 500 \\ - 200 \\ \hline \end{array}$ | 5) $\begin{array}{r} 8 \\ \times 7 \\ \hline \end{array}$ |
| 6) $\begin{array}{r} 415 \\ \times 93 \\ \hline \end{array}$ | 7) $\begin{array}{r} 425 \\ \times 10 \\ \hline \end{array}$ | 8) $\begin{array}{r} 73 \\ \overline{) 17} \end{array}$ | | |

You might say that in 1-7 the correct procedure is to enter the answer from right to left, but I would guess that in actual practice few of you would do number 5 that way; wouldn't you simply write '56'? I would further guess that many of you would write the

answers to numbers 1, 4, and 7 from left to right. Number 8 must be done from left to right. Number 6 is a three-step problem, so the answer cannot be written directly in either direction.

When planning for input of the answers to these problems on the computer, there is no clear cut criterion to help you to decide whether to go right to left or left to right! It is possible to program the computer to accept answers in either direction, but it is not possible to predict the direction the student will decide to use when he is solving the problem. Requiring answers to be inputted according to a variable set of criteria will result in confusion.

I can see two reasonable solutions to this dilemma: allow the student to place the cursor wherever he decides to start inputting the answer or to input all answers from left to right, regardless of the method used to calculate the answer. The former method would still result in confusion among younger children, so I recommend the latter.

I consider writing educational programs for elementary school students a highly specialized field. Professional programmers who are not familiar with the characteristics of young children may produce programs that are structurally excellent but still do not achieve their objectives. This material should prove helpful to both professional programmers and school staff members who desire to write effective educational programs for elementary school students. ■

THE ALTERNATE SOURCE

TASMON

Written By Bruce Hansen

- Replace Registers
- Modify Memory
- Hex Memory Dump
- ASCII Memory Dump
- Disassembled Dump
- Disassemble to Printer
- Dump Screen to Printer
- Sum Hex Values
- Subtract Hex Values
- Find 1-4 Consecutive Bytes
- Skip Forward One Instruction
- Back Up One Instruction
- Clear Screen
- Relocate System Programs
- Move a Block of Memory
- Load a System Tape
- Load a /CMD Disk File
- Write a System Tape
- Write a /CMD Disk File
- Disassemble to Disk
- Disassemble to Tape
- ROM or RAM Breakpoints (9)
- Set Breakpoints
- Display Breakpoints
- Clear Breakpoints
- Single Step with CALL in full
- Single Step through CALLs
- Trace at Eight Speeds
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- Scan Track Sectors
- Locate Disk Sectors
- Copy Track
- Duplicate Disk
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- Redefine any key at ANY time
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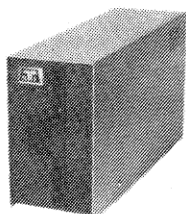
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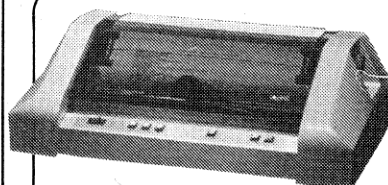
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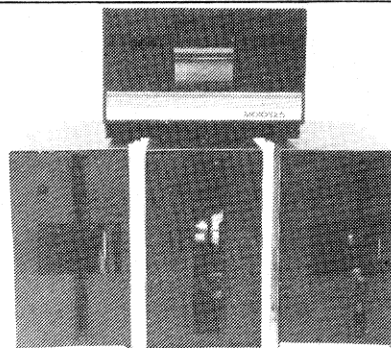
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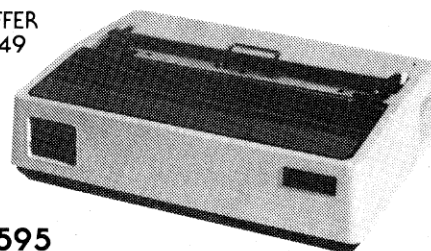
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Simul-80-A Weird Game

Dennis Bathory Kitz
Roxbury, VT 05669

How's your computer club doing with machine or assembly language programming? Are your advanced students chafing at the limitations of BASIC, but can't get a handle on the operation of the CPU? Then Simul-80 is for you! It is a frenzied, physically dangerous simulation of the internal operations of a mythical microprocessor similar to the TRS-80, in which every participant plays the role of a basic computer element.

Simul-80 was first attempted during a microprocessor seminar at the Vermont environmental engineering firm of DuBois & King, Inc., and lapsed into total confusion as the engineer in charge of adding two one-digit numbers came up with the wrong answer. Here's the game and the rules... good luck!

The Players

Fifteen people (including one human) are needed to play a complete round of Simul-80, although eight can play a serviceable game. If absolutely necessary, players marked with an asterisk can be replaced with props.

The Accumulator (A) performs simple addition and subtraction, and turns over a zero card and a carry card. This is the hardest intellectual task in the game, and the ability to count to ten is prerequisite.

The Program Counter (PC) keeps track of the current position within the program. The ability to count accurately up to one is essential.

The Memory (MEM) holds a great card of information—but can see only one number on it at a time. Roulette table experience is an added plus for this player.

The Instruction Decoder (ID) accepts numbers from MEM and looks up their meaning on a master list. Hire an accountant for this task.

The Address Bus runs from place to place informing other participants where they should be. Sneakers are recommended.

The Data Bus also runs from place to place with precious digits of information. This is the most strenuous physical task; sneakers are recommended, knee pads and helmets are required.

*Four Registers (B, C, H, and L) write down numbers when told to do so. Leg irons may be used to hold these players in place.

*Two drones, the Zero (Z) and Carry/Borrow (CY) flags hold up cards when told to do so. Avoid using Dr. Strangelove types here.

The Clock acts like a square dance caller and keeps the whole thing together. A crew-cut is desirable, along with a touch of West Virginia twang.

An Input/Output Device (I/O) gives and accepts information at the beginning and end of the program. There will be enough time in between for this player to step out for a seven-course meal at the Lido.

For simplicity, this simulation does not provide for a stack pointer, nor any sort of interrupt functions, though it can easily be expanded to include them. A few other activities have been modified for sanity's

sake...ordinary decimal numbers are used, not such nasties as binary or hex.

The Instruction Set

The instruction set is divided into simple groups, and code numbers are assigned to represent each of the individual instructions. The instructions include the following:

- **Loads.** The accumulator and the four registers may be given numerical information, which they hold on to until otherwise instructed. There are eight load commands in Simul-80.

- **Increments and Decrements.** The registers may change the positions of their wall cards by one (see Props, below). There are four such instructions in the game.

- **Adds and Subtracts.** The accumulator may perform simple addition and subtraction when instructed to do so. Comparisons are a kind of subtraction, but no result is obtained; only the flags are altered. Seven arithmetic functions are available.

- **Jumps.** The program counter shifts its current position in memory to a new one, and the program continues from there. Three jumps are used in this instruction set.

- **Special Instructions.** There are three: One clears everything out of the accumulator, another does nothing, and the last halts the operation of the program.

Listing 2 describes the instructions in numerical order. Since programs can actually be written in Simul-80 code, the instruction set can be expanded to include commands #6, 15 to 19, 21 to 24, 32, 35 to 39, and 41 to 98.

The Program

Listing 1 presents a complete program in

"Simul-80...lapsed into total confusion as the engineer... adding two one-digit numbers came up with the wrong answer."

Simul-80 numerical code and Simul-80 mnemonics. The first column contains the address the program counter will hold aloft for all to see; the second column contains labels for observers to identify segments of the program (the players never see these); the third column contains the machine's instructions which memory holds and the instruction decoder must interpret. The players do not see these last two columns either. The fourth column, containing the abbreviated descriptions of each instruction (the mnemonics), and the last column, presenting detailed comments about the program's operation.

The routine performed by this simulation is the addition and subtraction of a column of two-digit numbers. There are a few limitations which the human using the I/O device must respect when writing for this single-precision computer:

- Only two-digit numbers may be used. Two is written 02, seven is written 07, etc., and no numbers can be greater than 99.
- No subtotal may be negative, nor may the total be negative.
- No subtotal may exceed 999, nor may the total exceed 999.
- Addition (+) is indicated by using code 01, subtraction (-) by using code 02, and total or equals (=) by using code 03.
- Addition and subtraction may be performed in any order, but equals (=) must be the final command. For example, to produce the result of: $3 + 15 + 98 - 33 + 12 - 18 + 67 - 13 + 1$, it is coded: 03 01 15 01 98 02 33 01 12 02 18 01 67 02 12 01 01 03.

The coding requirement for the human is to take the original problem, make sure every number is converted to exactly two digits, and replace the mathematical signs with their equivalent code numbers. Notice that it makes no difference that $1 + 1$ is coded 01 01 01. It's the proper order that counts.

The Props

- A Coding Sheet. This is a lined sheet on which the controlling human lists the problem being computed. The I/O device requires these numbers, but is not capable of creating or correcting their order.
- Identification Tags. All performers must be properly identified so that the traveling address bus and data bus can find them. The accumulator, zero and carry/borrow flags, memory and instruction decoder are seated; the program counter, four registers, and the I/O device should stand. The clock may be anywhere within hearing distance of all players.
- Information Sheets. Since players will hardly be able to memorize all their actions, information or instruction cards must be provided. The text for each card is present-

Program Listing 1.

| Address | Label | Instruction | Mnemonic | Comment |
|---------|--------|-------------|-----------------|---------------------------------------|
| 01 | START | 01 | LD A,(B) | ;Get "tens" digit from input |
| 02 | | 10 | LD (H),A | ;Put it in "tens" subtotal register |
| 03 | | 02 | LD A,(C) | ;Get "ones" digit from input |
| 04 | | 11 | LD (L),A | ;Put it in "ones" subtotal register |
| 05 | NXTINS | 03 | INC BC PTR | ;Bump input pointer by one |
| 06 | | 02 | LD A,(C) | ;Get arithmetic code from input |
| 07 | | 20 01 | CP 01 | ;Addition code = 1; is it? |
| 09 | | 31 21 | JP Z, "ADD" | ;Go to addition if code = 1 |
| 11 | | 20 02 | CP 02 | ;Subtraction code = 2; is it? |
| 13 | | 31 52 | JP Z, "SUB" | ;Go to subtraction if code = 2 |
| 15 | | 20 03 | CCP 03 | ;Equals or total code = 3; is it? |
| 17 | | 31 90 | JP Z, "END" | ;Go to end if code = 3 |
| 19 | | 34 83 | JP "ERR" | ;Go to error trap if ≠ 1, 2, or 3 |
| 21 | ADD | 03 | INC BC PTR | ;Bump pointer to value to add |
| 22 | | 02 | LD A, (C) | ;Get "ones" digit from input |
| 23 | | 26 | ADD A,(L) | ;Add previous "ones" subtotal |
| 24 | | 11 | LD (L),A | ;Save new "ones" subtotal |
| 25 | | 33 39 | JP NC, "HIBYT" | ;Go if result not greater than 9 |
| 27 | | 04 | LD A,(H) | ;If > 9, get "tens" subtotal |
| 28 | | 27 01 | ADD A,01 | ;Let Tens = Tens + 1 |
| 30 | | 10 | LD (H),A | ;Save new "tens" subtotal |
| 31 | | 33 39 | JP NC, "HIBYT" | ;Go if result not greater than 9 |
| 33 | | 07 | INC HL PTR | ;If > 9, bump to "hundreds" place |
| 34 | | 05 | LD A,(L) | ;Get previous "hundreds" subtotal |
| 35 | | 27 01 | ADD A,01 | ;Let Hundreds = Hundreds + 1 |
| 37 | | 11 | LD (L),A | ;Save new "hundreds" subtotal |
| 38 | | 08 | DEC HL PTR | ;Bump pointer back to normal |
| 39 | HIBYT | 01 | LD A,(B) | ;Get "tens" digit from input |
| 40 | | 25 | ADD A,(H) | ;Add previous "tens" subtotal |
| 41 | | 10 | LD (H),A | ;Save new "tens" subtotal |
| 42 | | 33 05 | JP NC, "NXTINS" | ;Go back (done) if not greater than 9 |
| 44 | | 07 | INC HL PTR | ;If > 9, bump to "hundreds" place |
| 45 | | 05 | LD A,(L) | ;Get previous "hundreds" subtotal |
| 46 | | 27 01 | ADD A,01 | ;Let Hundreds = Hundreds + 1 |
| 48 | | 11 | LD (L),A | ;Save new "hundreds" subtotal |
| 49 | | 08 | DEC HL PTR | ;Bump pointer back to normal |
| 50 | | 34 05 | JP "NXTINS" | ;Done—go back for more input |
| 52 | SUB | 03 | INC BC PTR | ;Bump pointer to value to subtract |
| 53 | | 05 | LD A,(L) | ;Get previous "ones" subtotal |
| 54 | | 28 | SUB A,(C) | ;Subtract new value from previous |
| 55 | | 11 | LD (L),A | ;Save new "ones" subtotal |
| 56 | | 33 70 | JP NC, "HBT2" | ;Go if result no borrow (> 0) |
| 58 | | 04 | LD A,(H) | ;If borrow, get "tens" digit subtotal |
| 59 | | 29 01 | SUB A,01 | ;Let Tens = Tens - 1 |
| 61 | | 10 | LD (H),A | ;Save new "tens" subtotal |
| 62 | | 33 70 | JP NC, "HBT2" | ;Go if result no borrow (> 0) |
| 64 | | 07 | INC HL PTR | ;If borrow, bump to "hundreds" place |
| 65 | | 05 | LD A,(L) | ;Get "hundreds" digit subtotal |
| 66 | | 29 01 | SUB A,01 | ;Let Hundreds = Hundreds - 1 |
| 68 | | 11 | LD (L),A | ;Save new "hundreds" subtotal |
| 69 | | 08 | DEC HL PTR | ;Bump pointer back to normal |
| 70 | HBT2 | 04 | LD A,(H) | ;Get previous "tens" value |
| 71 | | 30 | SUB A,(B) | ;Subtract new value from previous |
| 72 | | 10 | LD (H),A | ;Save new "tens" subtotal |
| 73 | | 33 05 | JP NC, "NXTINS" | ;Go back (done) if no borrow |
| 75 | | 07 | INC HL PTR | ;If borrow, bump to "hundreds" place |
| 76 | | 05 | LD A,(L) | ;Get "hundreds" subtotal |
| 77 | | 29 01 | SUB A,01 | ;Let Hundreds = Hundreds - 1 |
| 79 | | 11 | LD (L),A | ;Save new "hundreds" subtotal |
| 80 | | 08 | DEC HL PTR | ;Bump pointer back to normal |
| 81 | | 34 05 | JP "NXTINS" | ;Done—go back for more input |
| 83 | ERR | 09 | DEC BC PTR | ;Bump input pointer back |
| 84 | | 12 09 | LD A,09 | ;Get error code digit ready |
| 86 | | 13 | LD (B),A | ;Let "Tens" value = error code 9 |
| 87 | | 14 | LD (C),A | ;Let "Ones" value = error code 9 |
| 88 | | 03 | INC BC PTR | ;Bump pointer to bad code |
| 89 | | 99 | HALT | ;Halt program and report to human |
| 90 | END | 05 | LD A,(L) | ;Get "ones" subtotal value |
| 91 | | 14 | LD (C),A | ;Put subtotal in output register |
| 92 | | 04 | LD A,(H) | ;Get "tens" subtotal value |
| 93 | | 13 | LD (B),A | ;Put subtotal in output register |
| 94 | | 07 | INC HL PTR | ;Bump pointer to "hundreds" place |

Program continues

| | | | |
|----|----|------------|------------------------------------|
| 95 | 05 | LD A,(L) | ;Get "hundreds" subtotal value |
| 96 | 03 | INC BC PTR | ;Bump output pointer one position |
| 97 | 14 | LD (C),A | ;Put "hundreds" subtotal in output |
| 98 | 40 | CLR A | ;Set A equal to zero |
| 99 | 13 | LD (B),A | ;Put zero in "thousands" place |
| 00 | 99 | HALT | ;Stop program and report to human |

*Simul-80 Program for Addition, Subtraction,
and Total, with Error Trapping*

Program Listing 2

| NUMERICAL CODE | DESCRIPTION | ABBREVIATION |
|----------------|--|--------------|
| 00 | No operation (serves as a delay) | NOP |
| 01 | Load Accumulator with contents of Register B | LD A,(B) |
| 02 | Load Accumulator with contents of Register C | LD A,(C) |
| 03 | Increment the pointer position of B and C | INC BC PTR |
| 04 | Load Accumulator with contents of Register H | LD A,(H) |
| 05 | Load Accumulator with contents of Register L | LD A,(L) |
| 06 | No such instruction... computer reports error | ----- |
| 07 | Increment the pointer position of H and L | INC HL PTR |
| 08 | Decrement the pointer position of H and L | DEC HL PTR |
| 09 | Decrement the pointer position of B and C | DEC BC PTR |
| 10 | Load H Register contents with Accumulator | LD (H),A |
| 11 | Load L Register contents with Accumulator | LD (L),A |
| 12 NN | Load Accumulator with the value NN | LD A,NN |
| 13 | Load B register contents with Accumulator | LD (B),A |
| 14 | Load C Register contents with Accumulator | LD (C),A |
| 15-19 | No such instruction... computer reports error | ----- |
| 20 NN | Compare Accumulator with the value NN | CP A,NN |
| 21-24 | No such instruction... computer reports error | ----- |
| 25 | Add contents of Register H to the Accumulator | ADD A,(H) |
| 26 | Add contents of Register L to the Accumulator | ADD A,(L) |
| 27 NN | Add the value NN to the Accumulator | ADD A,NN |
| 28 | Subtract contents of Register C from Accumulator | SUB A,(C) |
| 29 NN | Subtract value NN from the Accumulator | SUB A,NN |
| 30 | Subtract contents of Register B from Accumulator | SUB A,(B) |
| 31 NN | If Z is set, change Program Counter to NN | JP Z,NN |
| 32 | No such instruction... computer reports error | ----- |
| 33 NN | If CY is not set, change Program Counter to NN | JP NC,NN |
| 34 NN | In any condition, change Program Counter to NN | JP NN |
| 35-39 | No such instruction... computer reports error | ----- |
| 40 | Clear the Accumulator to Zero | CLR A |
| 41-98 | No such instruction... computer reports error | ----- |
| 99 | Program halts operation | HALT |

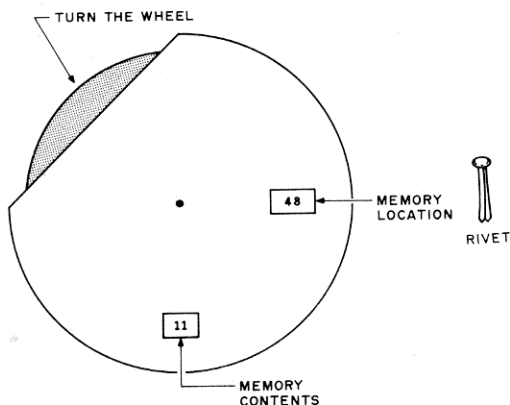


Fig. 1.

ed later in this article.

- **The Program.** Memory must have a complete listing of the program, but it should be made up in such a way that the contents of only one memory location are visible at a time; the wheel shown in Fig. 1 is ideal for this purpose.

- **Wall Charts.** Since the registers are not expected to be intelligent, they must have wall charts to refer to. Such charts usually consist of a pie-shaped figure with a movable arrow. The arrow points to blank spaces which may be filled with numbers as the need arises. See Fig. 2.

- **Flash Cards.** A pair of true drones are the Zero and Carry/Borrow flags, who are each given a card. One side reads "set," the other reads "not set."

- **A Program Counter Booklet.** This is a flip-book containing one hundred sequential numbers, 01 through 00. At each change in the program's position, the program counter flips to the proper number.

- **Pencil and Paper.** Every player should be provided with writing materials and enough scraps of paper to write down a value, should it be needed, during every step of the program.

- **Shoulder and Knee Pads.** This game is not approved under the Occupational Safety and Health Act (OSHA), and in a small room these pads will be essential.

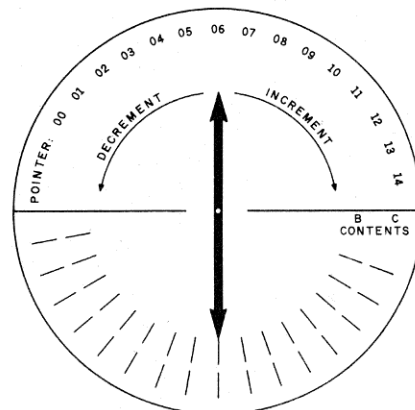


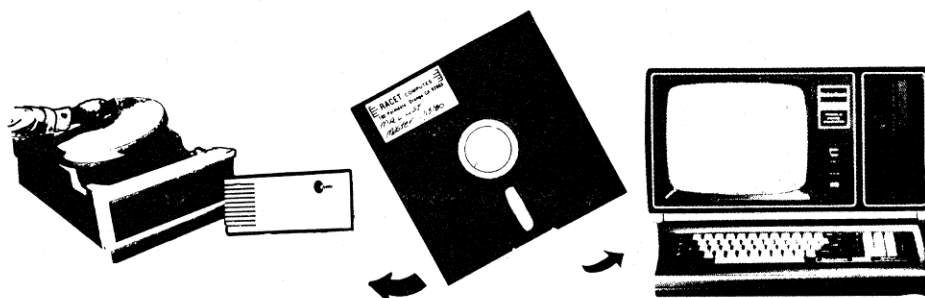
Fig. 2.

Program Details

Before looking at the rules of the game, let's have a look at the program itself and what it does; refer to Listing 1.

This program represents the operation of a theoretical microprocessor similar to the one which controls the TRS-80, although it makes a few assumptions which are unlike the Z-80's operation. Some commands perform the same functions, but the mnemonics are quite dif-

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ferent (in Z-80 language, there is no CLRA, but the function XOR A—exclusive OR the accumulator—has the same result).

In a real processor, the registers' pointers actually point to memory, and should also involve a trip through our MEM player. But for convenience, Simul-80 lets B, C, H, and L have their own anonymous block of memory. In actual practice, we would have to identify these registers and their positions as well.

The I/O device has accepted coded information from the human, and recorded it on the wall chart for registers B and C (the method is explained in the Rules of the Game). The first instructions command the accumulator to take what is in B (the "tens" digit) and give it to H; the same is done to transfer C (the "ones" digit) to L. In other words, registers B and C hold the two-digit input value, and, after the intervention of the accumulator, registers H and L will hold the running subtotal.

At NXTINS (next instruction), we move the pointer for B and C one position forward, and get the value pointed to by C, putting it in A. It is compared to 01, the code for add (+); if the result of the comparison is exact, it will set the zero flag. This is done because comparison is a kind of subtraction that leaves the minuend and subtrahend intact; no result is produced, only a flag is tweaked. It is like the statement $A > B$, where neither A nor B is changed, but an evaluative result is produced. If the zero flag is set, the program moves to the position marked ADD.

If the comparison is not exact, the program falls through to the next instruction in order, and checks the value against 02, the code for subtract (-); if an exact comparison sets the zero flag this time, a jump is made to SUB. Failing that test, the value is checked for the equals (=) code, and jumps to END if the comparison matches.

If all these tests fail—that is, if the code is neither 01, 02 nor 03—we do not have one of the three permitted instructions of the game, and the program as entered by the human must be in error. Therefore (we are now looking at address #19), the program jumps along to the position marked ERR, eventually halting the action.

Let's assume the code was that for addition. Moving to ADD at address #21, the program is told to increment the BC pointer once more. If you are following the BC pointer, you will see that it must now be pointing to the number we are to add, since the numbers and math codes follow each other in alternating sequence.

To effect this, the accumulator loads up with the value in register C (the "ones" digit of the value to add), and next adds to itself

Information Sheets

Address Bus

1. During cycle two, go where called, and accept the value given to you.
2. Perform the following actions:

| IF THE INSTRUCTION YOU RECEIVE IS: | PERFORM THIS ACTIVITY |
|---------------------------------------|---|
| 03 | Advance the B and C pointer. |
| 07 | Advance the H and L pointer. |
| 08 | Decrease the H and L pointer. |
| 09 | Decrease the B and C pointer. |
| 31 | Wait for the next cycle two and get the next value from MEM. Ignore this value, but immediately check Z. If Z is SET, then give your value to PC at the beginning of the next cycle one. If Z is NOT SET, do nothing. |
| 33 | Wait for the next cycle two and get the next value from MEM. Ignore this value, but immediately check CY. If CY is NOT SET, give your value to PC at the beginning of the next cycle one. If CY is SET, do nothing. |
| 34 | Wait for the next cycle two and get the next value from MEM. Immediately give your value to PC at the beginning of the next cycle one. |
| IF NONE OF THE ABOVE | Do nothing... this is a machine failure that will lead to chaos. |

Accumulator

1. During cycle one, give any value requested by the data bus.
2. During cycle two, receive any value given by the data bus.
3. During cycle three, perform calculations as follows:

IF THE VALUE YOU
RECEIVE IS:

PERFORM THIS OPERATION:

Less than or
equal to 9
25, 26, 27

Make this your current value

1. Wait until the next cycle three, then add the value you will receive to your current value. The result becomes your new current value.

2. Immediately do one of the following:

| Result | Give to Z | Give to CY |
|--------|-----------|------------|
| < 9 | NOT SET | NOT SET |
| = 10 | SET | SET |
| > 10 | NOT SET | SET |

28, 29 or 30

1. Wait until the next cycle three, then subtract the value you will receive from your current value. The result becomes your new current value. You may borrow a "phantom" one if needed to complete the subtraction.

2. Immediately do one of the following:

| Result | Give to Z | Give to CY |
|-----------|-----------|------------|
| > 0 | NOT SET | NOT SET |
| = 0 | SET | NOT SET |
| If borrow | NOT SET | SET |

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1. Wait until the next cycle three, then compare that value with your current value. Your current value remains unchanged.

2. Immediately do one of the following:

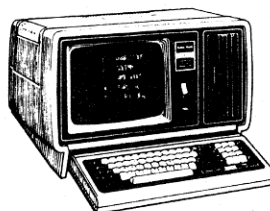
| Result | Give to Z | Give to CY |
|-----------------|-----------|------------|
| C.V. is greater | NOT SET | NOT SET |
| C.V. is greater | SET | NOT SET |
| C.V. is less | NOT SET | SET |

40

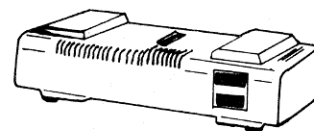
1. Set your current value to zero; give SET to Z, NOT SET to CY.

Remember: Your current value may only be 0 through 9.

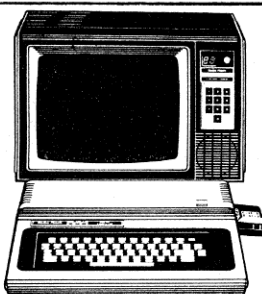
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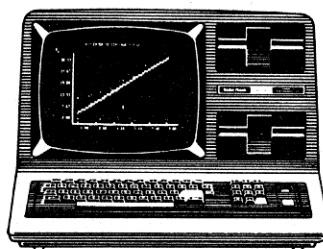
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“Fifteen people (including one human) are needed to play a complete round of Simul-80.”

the value in register L (recall that this is the “ones” digit of the subtotal pair of registers). The result is a new subtotal.

The accumulator then takes its single-digit result (C plus L), and saves that sum in L. In the meantime, the carry flag may or may not have been set, depending on whether or not the total of C + L was greater or less than nine. If the total was less than or equal to nine, no carry would be generated, and the program moves directly to address #39, labeled HIBYT. A similar activity is performed with the “tens” digit, getting it from B, adding H to it, and putting it back in H. If once again no carry is generated, the program loops back to the address labeled NXTINS, and goes through its add/subtract/equals code-checking process once again.

What happens if a carry is produced? It can happen in several ways: if the ones digit carries into the tens digit; if the tens digit carries into the hundreds digit; and if, when the ones digit carries into the tens digit, it forces the tens digit to carry into the hundreds place. In principle, each is handled the same way: a carry value of one is added to the higher digit. For example, nine plus nine equals 18, or nine plus nine equals eight-carry-the-one.

Our registers are only two digits wide . . . so how do we get a hundreds place? Simply by moving the registers’ pointer up one position, and stashing the carried value there. In other words, if it’s too big for the box, get another box. This happens in instructions found at #44 through #49.

When the arithmetic is finished, the program will move back to NXTINS. If a code of 02 is found, it means a jump to position SUB. In this case, the accumulator must perform subtraction (start at position #52). The curious thing is that the carry flag serves double duty . . . since we are either adding or subtracting (never both at once) the flag can also signal a borrow. If the result of subtraction ends up being less than zero, the accumulator simply borrows an imaginary one to complete the subtraction, and sets the carry flag. The rest of the instructions take it from there, just as they do with addition. Follow through addresses #56 to #61, #62 to #69, and #75 to #80, and you can see that it works.

In a properly coded program, the computer will at last encounter code 03, which is the equals code and initiates a termination sequence to produce a correct answer. The jump is made to the position labeled END, found at address #90. The value of L is placed into C via A, the value at H is similarly placed into B. Both sets of pointers are moved forward, and the hundreds place is transferred from register L to register C.

The accumulator is cleared to zero at address #98, and that zero is placed into the B

Data Bus

1. During cycle two, go where called, and accept the value given to you.
2. Perform the following actions:

| IF THE VALUE YOU RECEIVE IS: | THEN PERFORM THIS ACTIVITY: |
|---------------------------------|---|
| 01 | Get value from B during cycle two. Give it to A during cycle three. |
| 02 | Get value from C during cycle two. Give it to A during cycle three. |
| 04 | Get value from H during cycle two. Give it to A during cycle three. |
| 05 | Get value from L during cycle two. Give it to A during cycle three. |
| 10 | Get value from A during cycle two. Give it to H during cycle three. |
| 11 | Get value from A during cycle two. Give it to L during cycle three. |
| 12 | Wait for next cycle two, and get value from MEM. Give it to A during cycle three. |
| 13 | Get value from A during cycle two. Give it to B during cycle three. |
| 14 | Get value from A during cycle two. Give it to C during cycle three. |
| 20 | Give your instruction to A during cycle two. Wait for next cycle two, get value from MEM and give it to A during that cycle. |
| 25 | Give you instruction (25) to A during cycle two, and immediately get value from H and give it to A during that cycle. |
| 26 | Give your instruction (26) to A during cycle two, and immediately get value from L and give it to A during that cycle. |
| 27 | Give your instruction (27) to A during cycle two. Wait for next cycle two, get value from MEM and give it to A during that cycle. |
| 28 | Give your instruction (28) to A during cycle two, and immediately get value from C and give it to A during that cycle. |
| 29 | Give your instruction (29) to A during cycle two. Wait for next cycle two, get value from MEM and give it to A during that cycle. |
| 30 | Give your instruction (30) to A during cycle two, and immediately get value from B and give it to A during that cycle. |
| 40 | Give your instruction (40) to A during cycle two. |
| IF NONE OF THE ABOVE | Do nothing . . . the machine has failed, and chaos will reign. |

Instruction Decoder (ID)

1. During cycle one, accept a value from MEM, and check it against the master list that follows.
2. During cycle two, call for the appropriate person as indicated below:

| IF YOU RECEIVE FROM MEM: | ASK FOR THE PRESENCE OF AND GIVE YOUR VALUE TO: |
|--------------------------|--|
| 00 | No one. |
| 01 | Data Bus. |

Information sheets continue


```

02      Data Bus.
03      Address Bus.
04      Data Bus.
05      Data Bus.
07      Address Bus.
08      Address Bus.
09      Address Bus.
10      Data Bus.
11      Data Bus.
12      Data Bus. Then wait for the next cycle two
        and call for Data Bus again.
13      Data Bus.
14      Data Bus.
20      Data Bus. Then wait for the next cycle two
        and call for Data Bus again.
25      Data Bus.
26      Data Bus.
27      Data Bus. Then wait for the next cycle two
        and call for Data Bus again.
28      Data Bus.
29      Data Bus. Then wait for the next cycle two
        and call for Data bus again.
30      Data Bus.
31      Address Bus. Then wait for the next cycle
        two and call for Address Bus again.
33      Address Bus. Then wait for the next cycle
        two and call for Address Bus again.
34      Address bus. Then wait for the next cycle
        two and call for Address Bus again.
40      Data Bus.
99      Call out HALT.
IF NONE OF THE ABOVE Call Address Bus, and give it 34. Wait for
        the next cycle two, call Address Bus
        again, and give it 83.

```

Program Listing 3.

```

0  GOTO110
1  GOTO3920
2  GOTO4000
3  GOTO4080
4  GOTO4160
5  GOTO4240
6  GOTO6280
7  GOTO4320
8  GOTO4400
9  GOTO4480
10 GOTO4560
11 GOTO4640
12 GOTO4720
13 GOTO4830
14 GOTO4910
20 GOTO4990
25 GOTO5170
26 GOTO5360
27 GOTO5430
28 GOTO5520
29 GOTO5630
30 GOTO5720
31 GOTO5830
33 GOTO5930
34 GOTO6030
40 GOTO6110
99 GOTO6180
100 GOTO3850
105 REM * COPYRIGHT 1980 BY DENNIS BATHORY KITSZ
110 OUT254,2:CLS:CLER2000: REM OUT254,2 = HI SPEED, NORM VIDEO
120 ONERRORGOTO6490:DIMS(3,101):DIMPR$(3,101):DIMCD$(2,101)
130 FORX=0TO99:READIN$(1,X):NEXT
140 FORX=0TO99:READIN$(2,X):NEXT
150 FORX=0TO99:READIN$(3,X):NEXT
160 CLS:PRINT"A SIMULATION OF SIMUL-80"
170 PRINT:PRINT"DENNIS BATHORY KITSZ":PRINT"OCTOBER, 1980"
180 FORX=1TO1000:NEXT:CLS

```

Listing continues

register, which, had the program been longer, might have held the thousands place. At instruction 00, the program finally halts. The I/O device may then read the values in BC; the final equal sign code will have been replaced with the lower two digits of the total, and the position following will contain the upper digit of the total. The human may then read that total from the I/O device; it should be the correct answer.

One additional case needs to be dealt with. If an error was found in the coding (address #19), the program will move to address #83. Here the B and C register pointers are decremented to a position previous to the offending code, and that value is changed to 99; the pointer is re-incremented to the offending code, and the program halts. The I/O device then retrieves the contents of the BC register pair list. The human reading the final list can then see by the 99 code and the position of the pointer that the program did not conclude properly, and that an offending code was the cause of the program's halt.

The Rules of the Game

At power-up, the program counter (PC) should set the flip-book to 01, the accumulator (A) is zero, the flags (Z and CY) both read not set, and all the register (B, C, H, L) arrows are in their first position. Memory (MEM) sets its card to position 01, to match that held by PC. The instruction decoder (ID), data bus, and address bus are quiet. The computer is now idling.

The game begins when the human completes coding the addition/subtraction problem and hands it to the input/output (I/O) device. For this simulation, the I/O device acts like a direct memory access (DMA) circuit, which is independently capable of placing information into memory while the microprocessor is halted. The column of numbers is split and transferred to the B and C registers' wall card.

If the input was 06 01 17 02 10 03 (6 + 17 - 10 =), the transferred items would read:

| B REGISTER (tens digit) | C REGISTER (ones digit) |
|----------------------------|----------------------------|
| 0 | 6 |
| 0 | 1 |
| 1 | 7 |
| 0 | 2 |
| 1 | 0 |
| 0 | 3 |

When this work is complete, the I/O device tells the clock "ready", which allows the processor, whose operation had been suspended during human input, to continue.

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Program continues

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†Product Digital Research, Inc.

```

930 PRINT"READY TO ACCEPT SIMUL-80 PROGRAM LISTING ... AN"
940 PRINT"ADDRESS WILL PRESENTED; ENTER THE MACHINE CODE."
950 PRINT"THE MNEMONIC WILL BE DISPLAYED. TO TERMINATE THE"
960 PRINT"LISTING, ENTER 100 INSTRUCTIONS OR TYPE LETTER X."
970 PRINT"YOU MAY BEGIN ENTERING INSTRUCTIONS BELOW:"
980 PRINTSTRING$(64,95);
990 PRINT"ADDRESS: CODE: MNEMONIC: DESCRIPTION:"
1000 PRINT"-----"
1010 Q$=INKEY$:FORN=1TO300:NEXT:X=522:Y=1
1020 A=0:X=X+57:PRINT@X,IN$(1,Y);X=X+7
1030 PRINT@X,CHR$(95);A$=INKEY$
1040 IFA$=CHR$(8)THENPRINT@X," ";
1050 IFA$=CHR$(8)THENA=A-1:IFA<0THEN1070ELSEX=X-1:GOTO1030
1060 GOTO1080
1070 A=0:GOTO1030
1080 IFA$=" "THEN1030ELSEIFA$="X"THEN1170ELSEPRINT@X,A$;
1090 A=A+1:IFA=2THEN1100ELSEX=X+1:GOTO1030
1100 X=X-1:B$=CHR$(PEEK(15360+X)):C$=(CHR$(PEEK(15361+X)))
1110 D$=B$+C$:R=VAL(D$):FORN=0TO99
1120 IFIN$(1,N)=D$THENPRINT@X+7,IN$(2,N) " ELSENEXTN
1130 PRINT@X+20,IN$(3,N);
1140 PR$(1,Y)=D$:PR$(2,Y)=IN$(2,N):GOSUB1550
1150 IFX>900THENX=522:PRINT@X+62,STRING$(54,32);
1160 Y=Y+1:IFY=101THEN1170ELSE1020
1170 FORX=1TO500:NEXT:CLS
1180 PRINT"PROGRAM ENTRY IS COMPLETE; A LIST FOLLOWS."
1185 PR$(1,0)=PR$(1,100):PR$(2,0)=PR$(2,100):PR$(3,0)=PR$(3,100)
1190 FORY=1TO100:PR$(1,Y)=" ":PR$(2,Y)=" ":NEXT
1200 PRINT:X=1:FORY=1TO100
1210 FORX=XTOX+9:PRINT,IN$(1,X),PR$(1,X),PR$(2,X);PR$(3,X):NEXTX
1220 PRINT:PRINT
1230 PRINT"ENTER TO CONTINUE, CLEAR TO REPEAT, ";
1240 PRINTCHR$(94) " TO EDIT..."
1250 Q=PEEK(14400)
1260 IFQ=1THENNEXTYELSEIFQ=2THEN1265ELSEIFQ=64THEN1350ELSE1250
1262 GOTO1270
1265 CLS:PRINT:GOTO1200
1270 CLS:PRINT"THE PROGRAM IS ENTERED AND EDITED."
1280 PRINT"THE FOLLOWING CHOICES ARE AVAILABLE:":PRINT
1290 PRINT"1. COMPLETE RESTART":PRINT"2. RE-EDIT PROGRAM"
1300 PRINT"3. RUN PROGRAM":PRINT"4. END SIMULATION"
1305 PRINT"5. SEND LIST TO PRINTER"
1310 PRINT:PRINT"PLEASE ENTER THE NUMBER OF YOUR CHOICE"
1320 A$=INKEY$:IFA$=" "THEN1320
1330 X=VAL(A$):ONXGOTO110,1200,1660,3770,6400,1270
1340 GOTO1270
1350 A=0:B=1:K=128:FORC=1TO200:NEXTC:Q$=INKEY$
1360 PRINT@K,CHR$(32);A$=INKEY$:IFA$=" "THEN1370ELSE1380
1370 PRINT@K,CHR$(143);:GOTO1360
1380 IFA$=CHR$(13)THENCLS:PRINT:PRINT:NEXTY
1390 IFA$=CHR$(10)THENK=K+64:GOTO1360
1400 PRINT@K,A$;K=K+1:A=A+1:IFA=2THEN1410 ELSE1360
1410 D=PEEK(15358+K):E=PEEK(15359+K)
1420 N=0:F$=CHR$(D)+CHR$(E):F=VAL(F$)
1430 G=VAL(CHR$(PEEK(15374+K))+CHR$(PEEK(15375+K))):PR$(1,G)=F$
1440 IFIN$(1,N)=PR$(1,G)THEN1450ELSEN=N+1:IFN=100THEN1450ELSE1440
1450 IFF=12ORF=20ORF=27ORF=31ORF=33ORF=34THEN1490ELSE
1460 PR$(3,G)=" "
1470 PR$(2,G)=IN$(2,N):A=0:K=K+62:B=B+1:IFB>10THEN1480ELSE1360
1480 CLS:PRINT:PRINT:NEXTY
1490 PR$(2,G)=IN$(2,N):K=K+2
1500 A$=INKEY$:IFA$=" "THEN1500 ELSEPRINT@K,A$;K=K+1
1510 A$=INKEY$:IFA$=" "THEN1510 ELSEPRINT@K,A$;K=K+123
1520 PR$(3,G)=CHR$(PEEK(15236+K))+CHR$(PEEK(15237+K)):A=0
1530 PR$(1,G+1)=PR$(3,G):PR$(2,G+1)="-----":PR$(3,G+1)=" "
1540 B=B+2:IFB>10THEN1480 ELSE1360
1550 IFR=12ORR=20ORR=27ORR=29THEN1570
1560 IFR=31ORR=33ORR=34THEN1570 ELSERETURN
1570 A=0
1580 A$=INKEY$:IFA$=CHR$(8)THENPRINT@X+A+3," "
1590 IFA$=CHR$(8)THENA=A-1:IFA<0THENA=0:GOTO1580
1600 IFA$=" "THEN1580 ELSEPRINT@X+A+3,A$;
1610 A=A+1:IFA>1THEN1620 ELSE1580
1620 PR$(3,Y)=CHR$(PEEK(15363+X))+CHR$(PEEK(15364+X))
1630 PRINT@X+7+LEN(PR$(2,Y)),PR$(3,Y);
1640 PR$(1,Y+1)=PR$(3,Y):PR$(2,Y+1)="-----":PR$(3,Y+1)=" "
1650 Y=Y+1:RETURN
1660 CLS:PRINT"THE SIMULATION OF THE PROGRAM WILL BEGIN."
1670 FORX=1TO1500:NEXT:CLS
1680 PRINT@0,"HUMAN! ENTER YOUR SIMPLE MATH PROBLEM....."
1690 PRINT"REMEMBER: SUBTOTALS OR TOTALS > 0 AND < 999"

```

Program continues

SUPERSCRIPT

By Richard Wilkes

FOR
TRS-80*

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By Tom Stibolt



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1700 PRINT"USE NORMAL ARITHMETIC SEQUENCE, I.E., 6+5-3=":PRINT
1710 PRINT"ENTER THE PROBLEM BELOW (7 OPERATIONS)":PRINT:X=512
1720 AS=INKEY$:Q=PEEK(X+15360):QS=CHR$(Q)
1730 PRINT@X,QS;:AS=INKEY$:IFAS=" "THEN1740 ELSE1750
1740 PRINT@X,CHR$(143);:AS=INKEY$:IFAS=" "THEN1730 ELSE1750
1750 IFAS=CHR$(13)THEN1790 ELSEIFAS=CHR$(8)THEN1760 ELSE1780
1760 X=X-1:IFX<512THENX=512
1770 QS=" ":PRINT@X," ":GOTO1730
1780 QS=" ":PRINT@X,AS;STRING$(60,32);:X=X+1:GOTO1730
1790 PRINT@X,CHR$(93);:X=512
1800 AS=AS+CHR$(PEEK(X+15360))
1810 IF(PEEK(X+15360)<42)OR(PEEK(X+15360)>63)THEN1820 ELSE1840
1820 PRINT"CHR$(93)CHR$(93)"ERROR IN CODING AS MARKED"
1830 PRINT@X+64,CHR$(91);:GOTO1680
1840 X=X+1:IFPEEK(X+15360)=61THEN1880
1850 IFPEEK(X+15360)=93THEN1900
1860 IFPEEK(X+15360)=32THENX=X+1ELSE1800
1870 GOTO1860
1880 AS=AS+"="
1890 IFLEFT$(AS,1)=" "THENAS=RIGHT$(AS,(LEN(AS)-1)):GOTO1890
1900 CLS:PRINT"THE PROBLEM IS AS FOLLOWS":PRINT:PRINTAS:PRINT
1910 PRINT"AND IS CODED AS FOLLOWS":PRINT:H=LEN(AS)
1920 CD$(1,1)="03":B=2:FORX=H-1TOSTEP-2
1930 IFX=1THEN2030ELSEIFASC(MID$(AS,X-1,1))<48THEN1960ELSE1940
1940 CD$(1,B)=MID$(AS,X-1,2):X=X-1:IFX=1THEN2040 ELSE1970
1950 GOTO1980
1960 CD$(1,B)="0"+MID$(AS,X,1)
1970 IFMID$(AS,X-1,1)="+ "THENCDS(1,B+1)="01"
1980 IFMID$(AS,X-1,1)="- "THENCDS(1,B+1)="02"
1990 IFMID$(AS,X-1,1)="_ "THENCDS(1,B+1)="03"
2000 B=B+2:NEXTX:IFB>16THEN2010 ELSE2040
2010 FORX=1TO500:NEXT:CLS:PRINT"CALCULATION TOO LONG...";
2020 PRINT"7 OPERATIONS (+,-,=) MAX.":FORX=1TO500:NEXT:GOTO1660
2030 CD$(1,B)="0"+LEFT$(AS,1)
2040 J=1:FORX=B-2TOSTEP-1:CD$(2,J)=CD$(1,X):PRINTCD$(1,X) " ";
2050 J=J+1:NEXTX:PRINT:PRINT:PRINT
2060 PRINT"CHECK THE PROBLEM AGAINST THE RULES FOR CODING."
2070 PRINT"IF THERE ARE ANY DISCREPANCIES, RECODE THE PROBLEM."
2080 PRINT"ERROR-CHECKING IS DELIBERATELY LEFT INCOMPLETE."
2090 PRINT:PRINT"PRESS ENTER TO CONTINUE, CLEAR TO RECODE..."
2100 Q=PEEK(14400):IFQ=1THEN2120 ELSEIFQ=2THENCDS:GOTO1690
2110 GOTO2100
2120 CLS:PRINT"INSIDE IS THE DORMANT SIMULATOR....."
2130 FORX=1TO400:NEXT:OUT254,6
2140 REM * SIMULATION BEGINS
2150 IX=0:IY=0:DA$=" DATA ":AD$="ADDRESS":VL=0
2160 CLS:FORY=0TO47:SET(0,Y):SET(13,Y):SET(84,Y):SET(127,Y):NEXT
2170 SET(1,0):SET(2,0):SET(11,0):SET(12,0):PRINT@2,"B C";
2180 PRINT@50,"PROGRAM";
2190 FORX=84TO95:SET(X,0):NEXT:FORX=118TO127:SET(X,0):NEXT
2200 FORX=0TO13:SET(X,47):NEXT:FORX=84TO127:SET(X,47):NEXT
2210 FORY=0TO20:SET(16,Y):SET(29,Y):NEXT:PRINT@10,"H L";
2220 SET(17,0):SET(18,0):SET(27,0):SET(28,0)
2230 FORX=16TO29:SET(X,20):NEXT
2240 FORY=27TO34:SET(16,Y):SET(29,Y):NEXT:PRINT@586," Z ";
2250 FORY=39TO47:SET(16,Y):SET(29,Y):NEXT:PRINT@842," CY";
2260 SET(17,27):SET(18,27):SET(27,27):SET(28,27)
2270 SET(17,39):SET(18,39):SET(27,39):SET(28,39)
2280 FORX=17TO28:SET(X,34):SET(X,47):NEXT
2290 FORY=0TO12:SET(32,Y):SET(81,Y):NEXT
2300 PRINT@23,"ACCUMULATOR";:
2310 FORX=32TO81:SET(X,12):NEXT
2320 FORX=32TO41:SET(X,0):NEXT:FORX=72TO81:SET(X,0):NEXT
2330 FORY=15TO21:SET(44,Y):SET(81,Y):NEXT
2340 FORX=44TO81:SET(X,21):NEXT:PRINT@351,"ID";
2350 FORX=44TO58:SET(X,15):NEXT:FORX=68TO81:SET(X,15):NEXT
2360 FORY=39TO47:SET(44,Y):SET(61,Y):SET(65,Y):SET(81,Y):NEXT
2370 FORX=44TO61:SET(X,47):NEXT:FORX=65TO81:SET(X,47):NEXT
2380 FORX=44TO49:SET(X,39):NEXT:FORX=58TO61:SET(X,39):NEXT
2390 FORX=65TO68:SET(X,39):NEXT:FORX=78TO81:SET(X,39):NEXT
2400 PRINT@858,"PC";:PRINT@867,"MEM";
2410 FORY=24TO30:SET(65,Y):SET(81,Y):NEXT
2420 FORX=65TO81:SET(X,30):NEXT:PRINT@546,"CLOCK";
2430 SET(66,24):SET(80,24):PRINT@662,"BUS";
2440 BC=66:HL=74:AC=152:PR=108:ID=410:CL=612
2450 ZF=650:CY=906:PC=922:ME=932:BU=596
2460 QQ=1:GOSUB2650 :GOSUB2490 :GOSUB2540 :GOSUB2600
2470 GOTO6240
2490 REM*SUBROUTINE TO SET UP INPUT REGISTER AND CLOCK
2500 FORX=1TOJ:PRINT@ (BC+(X-1)*64),LEFT$(CD$(2,X),1);
2510 PRINT@ (BC+2+(X-1)*64),RIGHT$(CD$(2,X),1);:NEXTX

```

Program continues

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- Use with LP IV, DW II, IDS 440, IDS 460, NEC, DIABLO, QUME, and more!

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SUBSCRIP, BOLD TYPE, PITCHES.

YOU CAN EVEN UNDERLINE SPACES!

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```

2520 POKE15360+64,94:PRINT@CL,"1";
2530 RETURN
2540 REM*SUBROUTINE TO SET UP PROGRAM
2545 IFQQ>=100THENQQ=QQ-100
2550 FORX=QQTOQQ+13:X1=X:Q1=QQ:IFX1>=100THENX1=X1-100:Q1=Q1-100
2555 PRINT@ (PR+(X1-Q1)*64),IN$(1,X1) " ";
2560 PRINTPR$(1,X1);:PRINT@ (PR+8+(X1-Q1)*64),PR$(2,X1);
2570 PRINT " PR$(3,X1);:NEXTX
2580 POKE15360+106,94
2590 RETURN
2600 REM*SUBROUTINE TO SET UP OUTPUT REGISTER AND PC
2610 FORX=74TO6*64STEP64:PRINT@X,"0 0";:NEXTX
2620 PRINT@ZF,"NOT";:PRINT@CY,"NOT";
2630 POKE15360+72,94:PRINT@PC,"01";
2640 RETURN
2650 REM*SUBROUTINE TO WRITE BLANK SPACES
2660 PRINT@AC,STRING$(10,32);:PRINT@ID," ";:PRINT@CL," ";
2670 PRINT@ZF," ";:PRINT@CY," ";:PRINT@PC," ";
2680 PRINT@ME," ";:PRINT@BU," ";
2690 RETURN
2700 REM * BC TO BUSREM*BUS TO BC
2710 FORX=14TO46:SET(X,23):NEXT:FORY=23TO26:SET(46,Y):NEXT
2720 FORX=14TO46:RESET(X,23):NEXT
2730 FORY=23TO26:RESET(46,Y):NEXT
2740 RETURN
2750 REM * BUS TO BC
2760 FORY=26TO23STEP-1:SET(46,Y):NEXT
2770 FORX=46TO14STEP-1:SET(X,23):NEXT
2780 FORY=26TO23STEP-1:RESET(46,Y):NEXT
2790 FORX=46TO14STEP-1:RESET(X,23):NEXT
2800 RETURN
2810 REM * HL TO BUS
2820 SET(21,21):SET(21,22):FORX=21TO46:SET(X,23):NEXT
2830 FORY=23TO26:SET(46,Y):NEXT
2840 RESET(21,21):RESET(21,22):FORX=21TO46:RESET(X,23):NEXT
2850 FORY=23TO26:RESET(46,Y):NEXT
2860 RETURN
2870 REM * BUS TO HL
2880 FORY=26TO23STEP-1:SET(46,Y):NEXT
2890 FORX=46TO21STEP-1:SET(X,23):NEXT:SET(21,22):SET(21,21)
2900 FORY=26TO23STEP-1:RESET(46,Y):NEXT
2910 FORX=46TO21STEP-1:RESET(X,23):NEXT
2920 RESET(21,22):RESET(21,21):RETURN
2930 REM * A TO BUS
2940 FORY=13TO23:SET(36,Y):NEXT:FORX=36TO46:SET(X,23):NEXT
2950 FORY=23TO26:SET(46,Y):NEXT
2960 FORY=13TO23:RESET(36,Y):NEXT
2970 FORX=36TO46:RESET(X,23):NEXT
2980 FORY=23TO26:RESET(46,Y):NEXT
2990 RETURN
3000 REM * BUS TO A
3010 FORY=26TO23STEP-1:SET(46,Y):NEXT
3020 FORX=46TO36STEP-1:SET(X,23):NEXT
3030 FORY=23TO13STEP-1:SET(36,Y):NEXT
3040 FORY=26TO23STEP-1:RESET(46,Y):NEXT
3050 FORX=46TO36STEP-1:RESET(X,23):NEXT
3060 FORY=23TO13STEP-1:RESET(36,Y):NEXT
3070 RETURN
3080 REM * MEM TO PC & BACK
3090 SET(72,37):FORX=72TO52STEP-1:SET(X,36):NEXT:SET(52,37)
3100 RESET(72,37):FORX=72TO52STEP-1:RESET(X,36):NEXT
3110 RESET(52,37):SET(52,37)
3120 FORX=52TO72:SET(X,36):NEXT:SET(72,37):RESET(52,37)
3130 FORX=52TO72:RESET(X,36):NEXT:RESET(72,37):RETURN
3140 REM * A TO CY & BACK
3150 FORY=13TO23:SET(36,Y):NEXT:SET(35,23):SET(34,23)
3160 FORY=23TO42:SET(33,Y):NEXT:SET(32,42):SET(31,42)
3170 SET(30,42):FORY=13TO23:RESET(36,Y):NEXT
3180 RESET(35,23):RESET(34,23)
3190 FORY=23TO42:RESET(33,Y):NEXT:RESET(32,42)
3200 RESET(31,42):RESET(30,42):RETURN
3210 REM * CY TO A
3220 SET(30,42):SET(31,42)
3230 SET(32,42):FORY=42TO23STEP-1:SET(33,Y):NEXT
3240 SET(34,23):SET(35,23):FORY=23TO13STEP-1:SET(36,Y):NEXT
3250 RESET(30,42):RESET(31,42):RESET(32,42)
3260 FORY=42TO23STEP-1:RESET(33,Y):NEXT:RESET(34,23)
3270 RESET(35,23):FORY=23TO13STEP-1:RESET(36,Y):NEXT
3280 RETURN
3290 REM * A TO Z & BACK
3300 FORY=13TO23:SET(36,Y):NEXT:SET(35,23):SET(34,23)

```

Program continues

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|----------------------------|--|--|-----------------------------------|------------|--------|-------|--------|----------|---------|--------|---------------|--------|------------|---------|--------|-----------|----------|-----------|--------------|------|
| Flexible Disc 1s | IBM Compatible (128 B/S, 26 sectors) | 3060 | 2.19 | SFD-111110 | 473071 | 53428 | CM-F11 | 605056 | 2305930 | 40013 | FD1-128 | FD-1 | 740-0 | S/A 100 | 15002 | FD34-1000 | F111111X | 7870-K | 421602 | |
| | IBM Compatible (128 B/S, 26 sectors) w/ W/P/N | 3063 | 2.24 | — | — | — | — | — | — | — | — | — | 740-0 | — | — | — | — | — | — | |
| | IBM Compatible (128 B/S, 26 sectors) w/ W/P/N & Hub ring | 3064 | 2.55 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| | Single-Headed Drives | 1739 | 3.35 | SFD-113110 | 473072 | 54431 | — | — | — | 40015 | — | FD-2 | 740-2-0 | — | 16150 | FF34-2000 | F171111X | 7860-K | — | |
| | Single-Density Media | 3066 | 2.19 | — | 473077 | 54561 | — | 600509 | 1669959 | 40014 | — | — | 740-0 086 | — | 15003 | FD60-1000 | F116111X | — | — | |
| | IBM System 6 Compatible | 3109 | 2.19 | SFD-111210 | 473073 | — | — | 800584 | 2308945 | 40040 | — | — | 740-3600 | — | 15005 | FD36-1000 | F112111X | 7861-K | — | |
| | IBM Compatible (256 B/S, 15 sectors) | 3110 | 2.19 | — | 473074 | — | — | 800585 | 1669954 | 40044 | — | — | — | — | 15004 | FD60-1000 | F113111X | 7889-K | — | |
| | Shugart Compatible, 32 hard sector | 3015 | 2.19 | SFD-211010 | 470901 | 53802 | CM-F21 | 10111 | — | 40016 | PH1-32 | FD-132 | 740-32 | S/A-101 | 15025 | FD32-1000 | — | 7890-K | 421322 | |
| | Shugart Compatible, 32 hard sector REVERSIBLE | 3025 | 3.35 | SFD-213010 | — | — | — | — | — | 40017 | — | — | 740-2-32 | — | 15151 | FF32-2000 | — | 7880-K | — | |
| | Wang Compatible, 32 hard sector w/Hub ring | 3087 | 2.50 | — | — | 54491 | — | — | — | — | — | — | 740-32RM | — | — | — | F37A411X | — | — | |
| CPT 8000 Compatible | 3045 | 2.79 | — | — | — | — | — | — | — | — | — | — | — | — | 15226 | — | — | — | — | |
| Flexible Disc 1d | IBM Compatible (128 B/S, 26 sectors) | 3090 | 2.95 | SFD-121010 | 474021 | 54568 | — | 3740-110 | — | 40047 | FD1-128/M2100 | FD-1D | 741-0 | — | — | FD34-8000 | F131111X | 7857-K | 423002 | |
| | Soft Sector (128 B/S, 26 sectors) REVERSIBLE | 3093 | 3.99 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| | Shugart Compatible, 32 hard sector | 3091 | 2.95 | SFD-221010 | 470801 | 54596 | — | 101-110 | — | 40024 | PH1-320 | — | 741-32 | S/A-103 | 15075 | FD32-8000 | F33A410X | 7887-K | 423322 | |
| | Shugart Compatible, 32 hard sector REVERSIBLE | 3094 | 3.99 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| | Wang Compatible, 32 hard sector w/Hub ring | 3098 | 3.20 | — | — | — | — | — | — | — | — | — | — | — | — | — | F22A411X | — | — | |
| Flexible Disc 2s | Soft Sector (Unformatted) | 3101 | 3.84 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| | Soft Sector (128 B/S, 26 sectors) | 3113 | 3.84 | — | — | 54428 | — | 800814 | 1766870 | — | — | — | — | S/A-150 | 15153 | FD10-4026 | F121111X | — | — | |
| | Double-Headed Drives | 3106 | 3.84 | — | 473477 | 54226 | — | 800815 | 2736700 | 40043 | FD2-256D | — | 742-0 | — | 16154 | FD10-4015 | F122111X | 7856-K | 424812 | |
| | Single-Density Media | 3108 | 3.84 | — | — | — | — | — | — | — | FD2-32 | — | — | — | — | — | — | — | — | |
| Flexible Disc 2d | Soft Sector (Unformatted) | 3102 | 3.49 | — | 473485 | — | — | DT150 | — | 40026 | FD2-KDM | FD-2D | 743-0 | — | 16103 | DD34-4001 | — | — | 425002 | |
| | Soft Sector (128 B/S, 26 sectors) | 3115 | 3.49 | — | — | — | — | — | — | — | — | — | — | S/A-150 | — | — | — | — | — | |
| | Double-Headed Drives | 3103 | 3.49 | — | 473471 | 54325 | — | 800817 | 1766872 | 40019 | FD2-256D | — | 743-0/256 | — | 15101 | DD34-4026 | F144111X | 7858-K | 425602 | |
| | Double-Density Media | 3114 | 3.49 | — | 473472 | 54479 | — | 800818 | 1669044 | 40039 | — | — | 743-0/512 | — | 15100 | DD34-4015 | F145111X | — | 425612 | |
| | Soft Sector (512 B/S, 15 sectors) | 3114 | 3.49 | — | 473472 | 54479 | — | 800818 | 1669044 | 40039 | — | — | 743-0/512 | — | 15100 | DD34-4015 | F145111X | — | 425612 | |
| | Soft Sector (1024 B/S, 8 sectors) | 3104 | 3.49 | — | 473473 | 54485 | — | 800819 | 1669045 | 40020 | — | — | 743-0/1024 | — | 15102 | DD34-4008 | F147111X | 7859-K | 425622 | |
| | 32 Hard Sector | 3105 | 3.49 | SFD-321010 | 470851 | — | — | 101-20 | — | 40021 | PH2-32D | — | 743-32 | S/A-151 | 15125 | DD32-4000 | F34A411X | 7881-K | 425322 | |
| | Burroughs 8-80 Compatible 32 Hard Sector | 3092 | 3.49 | — | — | — | — | — | — | — | — | — | — | — | — | — | F34A611X | — | — | |
| | Soft Sector (1024 B/S, 8 sectors) w/Hub Ring | 3116 | 3.75 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| | Flexible Disc FD | Memorex 651 or Equiv. Drive Compatible | FD VI (Vinyl Jacketed) | 3071-2003 | 2.95 | — | 470651 | — | CM-F31 | FDIV | — | 40022 | — | FD-165 | 511-0 | — | 15026 | FD65-1000 | F61A111X | 7910 |
| Mini Flexible Disc 1s | Soft Sector (Unformatted) | 3401 | 1.99 | — | 475001 | 54256 | — | 104-1 | — | 40030 | MD1 | MD 1 | 744-0 | S/A-104 | 15300 | MS225-01 | M1A211X | 7897 | 441002 | |
| | 5 1/4" Single-Headed Drives | 3403 | 1.99 | — | 475010 | 54257 | — | 107-1 | — | 40051 | — | MD 110 | 744-10 | S/A-107 | 15325 | MS225-10 | M4A211X | 7898 | 441102 | |
| | Single-Density Media | 3405 | 1.99 | — | 475016 | 54258 | — | 105-1 | — | 40052 | MD1 | MD 116 | 744-16 | S/A-105 | 15326 | MS225-16 | M5A211X | 7899 | 441162 | |
| | Soft Sector (Unformatted) w/Hub Ring | 3431 | 2.19 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| | 10 Hard Sector, w/Hub Ring | 3433 | 2.19 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| 16 Hard Sector, w/Hub Ring | 3435 | 2.19 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | | |
| Mini Flexible Disc 1d | Soft Sector | 3417 | 2.24 | — | — | 54646 | — | 104-10 | — | — | — | — | — | — | — | — | MS240-01 | — | — | |
| | 5 1/4" Single-Headed Drives | 3418 | 2.24 | — | — | 54649 | — | 107-10 | — | — | — | — | — | — | — | — | MS240-10 | — | — | |
| | 16 Hard Sector | 3423 | 2.24 | — | — | 54652 | — | 105-10 | — | — | — | — | — | — | — | — | MD240-16 | — | — | |
| | Double-Density Media | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| Mini Flexible Disc 2d | Soft Sector | 3421 | 2.74 | — | — | 54624 | — | 104-20 | — | — | MD2-D | — | 745-0 | S/A-154 | — | MS250-01 | — | — | — | |
| | 5 1/4" Double-Headed Drives | 3423 | 2.74 | — | — | 54627 | — | 107-20 | — | — | — | — | 745-10 | S/A-157 | — | MS250-10 | — | — | — | |
| | Double-Density Media | 3425 | 2.74 | — | — | 54630 | — | 105-20 | — | — | MD2-D | — | 745-18 | S/A-155 | — | MS250-16 | — | — | — | |
| | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | |

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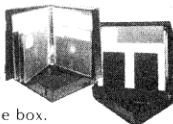
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3310 FORY=23TO31:SET(33,Y):NEXT:SET(32,31):SET(31,31)
3320 SET(30,31):FORY=13TO23:RESET(36,Y):NEXT
3330 RESET(35,23):RESET(34,23):FORY=23TO31:RESET(33,Y):NEXT
3340 RESET(32,31):RESET(31,31):RESET(30,31):RETURN
3350 REM * Z TO A
3360 SET(30,31):SET(31,31):SET(32,31)
3370 FORY=31TO23STEP-1:SET(33,Y):NEXT:SET(34,23):SET(35,23)
3380 FORY=23TO13STEP-1:SET(36,Y):NEXT
3390 RESET(30,31):RESET(31,31):RESET(32,31)
3400 FORY=31TO23STEP-1:RESET(33,Y):NEXT:RESET(34,23)
3410 RESET(35,23):FORY=23TO13STEP-1:RESET(36,Y):NEXT
3420 RETURN
3430 REM * MEM TO ID
3440 SET(72,37):FORX=72TO60STEP-1:SET(X,36):NEXT
3450 FORY=36TO22STEP-1:SET(60,Y):NEXT:RESET(72,37)
3460 FORX=72TO60STEP-1:RESET(X,36):NEXT
3470 FORY=36TO22STEP-1:RESET(60,Y):NEXT:RETURN
3480 REM * ID TO BUS
3490 FORY=22TO26:SET(46,Y):FORN=1TO20:NEXTN,Y
3500 FORY=22TO26:RESET(46,Y):FORN=1TO20:NEXTN,Y
3510 RETURN
3520 REM * MEM TO BUS
3530 SET(72,37):FORX=72TO46STEP-1:SET(X,36):NEXT
3540 FORY=36TO33STEP-1:SET(46,Y):NEXT
3550 RESET(72,37):FORX=72TO46STEP-1:RESET(X,36):NEXT
3560 FORY=36TO33STEP-1:RESET(46,Y):NEXT
3570 RETURN
3580 REM * BUS TO PC
3590 FORY=33TO36:SET(46,Y):FORN=1TO5:NEXTN,Y
3600 FORX=46TO52:SET(X,36):FORN=1TO5:NEXTN,X:SET(52,37)
3610 FORY=33TO36:RESET(46,Y):FORN=1TO5:NEXTN,Y
3620 FORX=46TO52:RESET(X,36):FORN=1TO5:NEXTN,X:RESET(52,37)
3630 RETURN
3640 REM * Z TO BUS
3650 FORX=30TO39:SET(X,31):FORN=1TO5:NEXTN,X
3660 FORX=30TO39:RESET(X,31):FORN=1TO5:NEXTN,X
3670 RETURN
3680 REM * CY TO BUS
3690 FORX=30TO33:SET(X,42):FORN=1TO3:NEXTN,X
3700 FORY=42TO31STEP-1:SET(33,Y):NEXT
3710 FORX=33TO39:SET(X,31):FORN=1TO3:NEXTN,X
3720 FORX=30TO33:RESET(X,42):FORN=1TO3:NEXTN,X
3730 FORY=42TO31STEP-1:RESET(33,Y):NEXT
3740 FORX=33TO39:RESET(X,31):FORN=1TO3:NEXTN,X
3750 RETURN
3760 GOTO3760
3770 PRINT:PRINT"PRESS "CHR$(34)"Q"CHR$(34);
3780 PRINT" TO END PROGRAM, CLEAR TO RECOVER"
3790 Q=PEEK(14400):IFQ=2THEN1270 ELSE
3800 Q=PEEK(14340):IFQ=2THEN3810 ELSE3790
3810 CLS:PRINT"THIS PROGRAM WAS PART OF SIMUL-80,"
3820 PRINT"A GAME CREATED BY DENNIS BATHORY KITSZ"
3830 END
3840 REM * EXECUTION SUBROUTINES BEGIN HERE
3850 REM * 00 * NOP
3860 PRINT@CL,"1":GOSUB6300:GOSUB3080:PRINT@ME,"00";
3870 GOSUB3430:PRINT@ID," NOP ";
3880 PRINT@CL,"2":FORN=1TO100:NEXT
3890 PRINT@CL,"3":FORN=1TO100:NEXT
3900 QQ=QQ+1:GOSUB2540
3910 RETURN
3920 REM * 01 * LD A, (B)
3930 PRINT@CL,"1":GOSUB6300:GOSUB3080:PRINT@ME,"01";
3940 GOSUB3430:PRINT@ID," LD A, (B) ";
3950 GOSUB3480:PRINT@CL,"2":PRINT@BU,DA$;
3960 GOSUB2750:GOSUB2700:VL=PEEK(15360+BC+IX)
3970 PRINT@CL,"3":GOSUB3000:PRINT@AC,CHR$(VL);
3980 QQ=QQ+1:GOSUB2540
3990 RETURN
4000 REM * 02 * LD A, (C)
4010 PRINT@CL,"1":GOSUB6300:GOSUB3080:PRINT@ME,"02";
4020 GOSUB3430:PRINT@ID," LD A, (C) ";
4030 PRINT@CL,"2":PRINT@BU,DA$;
4040 GOSUB3480:GOSUB2700:VL=PEEK(15360+BC+IX+2)
4050 PRINT@CL,"3":GOSUB3000:PRINT@AC,CHR$(VL);
4060 QQ=QQ+1:GOSUB2540
4070 RETURN
4080 REM * 03 * INC BC PTR
4090 PRINT@CL,"1":GOSUB6300:GOSUB3080:PRINT@ME,"03";
4100 GOSUB3430:PRINT@ID,"INC BC PTR";
4110 PRINT@CL,"2":PRINT@BU,AD$;

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Program continues

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```

4120 GOSUB3480 :GOSUB2750 :POKE(15360+BC+IX-2),149:IX=IX+64
4130 POKE(15360+BC+IX-2),94:PRINT@CL,"3";
4140 QQ=QQ+1:GOSUB2540
4150 RETURN
4160 REM * 04 * LD A,(H)
4170 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"04";
4180 GOSUB3430 :PRINT@ID," LD A,(H) ";
4190 GOSUB3480 :PRINT@CL,"2";:PRINT@BU,DA$;
4200 GOSUB2870 :GOSUB2810 :VL=PEEK(15360+HL+IY)
4210 PRINT@CL,"3";:GOSUB3000 :PRINT@AC,CHR$(VL);
4220 QQ=QQ+1:GOSUB2540
4230 RETURN
4240 REM * 05 * LD A,(L)
4250 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"05";
4260 GOSUB3430 :PRINT@ID," LD A,(L) ";
4270 GOSUB3480 :PRINT@CL,"2";:PRINT@BU,DA$;
4280 GOSUB2870 :GOSUB2810 :VL=PEEK(15360+HL+IY+2)
4290 PRINT@CL,"3";:GOSUB3000 :PRINT@AC,CHR$(VL);
4300 QQ=QQ+1:GOSUB2540
4310 RETURN
4320 REM * 07 * INC HL PTR
4330 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"07";
4340 GOSUB3430 :PRINT@ID,"INC HL PTR";
4350 PRINT@CL,"2";:PRINT@BU,AD$;
4360 GOSUB3480 :GOSUB2870 :POKE(15360+HL+IY-2),149:IY=IY+64
4370 POKE(15360+HL+IY-2),94:PRINT@CL,"3";
4380 QQ=QQ+1:GOSUB2540
4390 RETURN
4400 REM * 08 * DEC HL PTR
4410 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"08";
4420 GOSUB3430 :PRINT@ID,"DEC HL PTR";
4430 PRINT@CL,"2";:PRINT@BU,AD$;
4440 GOSUB3480 :GOSUB2870 :POKE(15360+HL+IY-2),149:IY=IY-64
4450 POKE(15360+HL+IY-2),94:PRINT@CL,"3";
4460 QQ=QQ+1:GOSUB2540
4470 RETURN
4480 REM * 09 * DEC BC PTR
4490 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"09";
4500 GOSUB3430 :PRINT@ID,"DEC BC PTR";
4510 PRINT@CL,"2";:PRINT@BU,AD$;
4520 GOSUB3480 :GOSUB2750 :POKE(15360+BC+IX-2),149:IX=IX-64
4530 POKE(15360+BC+IX-2),94:PRINT@CL,"3";
4540 QQ=QQ+1:GOSUB2540
4550 RETURN
4560 REM * 10 * LD (H),A
4570 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"10";
4580 GOSUB3430 :PRINT@ID," LD (H),A ";
4590 PRINT@CL,"2";:PRINT@BU,DA$;
4600 GOSUB3480 :GOSUB3000 :GOSUB2930 :PRINT@CL,"3";
4610 VL=PEEK(15360+AC):GOSUB2870 :POKE(15360+HL+IY),VL
4620 QQ=QQ+1:GOSUB2540
4630 RETURN
4640 REM * 11 * LD (L),A
4650 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"11";
4660 GOSUB3430 :PRINT@ID," LD (L),A ";
4670 PRINT@CL,"2";:PRINT@BU,DA$;
4680 GOSUB3480 :GOSUB3000 :GOSUB2930 :PRINT@CL,"3";
4690 VL=PEEK(15360+AC):GOSUB2870 :POKE(15360+HL+IY+2),VL
4700 QQ=QQ+1:GOSUB2540
4710 RETURN
4720 REM * 12 * LD A,NN
4730 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"12";
4740 GOSUB3430 :PRINT@ID," LD A, ";
4750 PRINT@CL,"2";:PRINT@BU,DA$;
4760 GOSUB3480:VL=VAL(CHR$(PEEK(15360+PR+67)))+CHR$(PEEK(15360+PR+1+67)))
4770 PRINT@CL,"3";:FORN=1TO500:NEXT:PRINT@CL,"1";:GOSUB3080
4780 PRINT@ME,STR$(VL);:GOSUB3430 :PRINT@ID+6,STR$(VL);
4790 PRINT@CL,"2";:GOSUB3520 :GOSUB3000 :PRINT@CL,"3";
4800 PRINT@AC-1,STR$(VL);
4810 QQ=QQ+2:GOSUB2540
4820 RETURN
4830 REM * 13 * LD (B),A
4840 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"13";
4850 GOSUB3430 :PRINT@ID," LD (B),A ";
4860 PRINT@CL,"2";:PRINT@BU,DA$;
4870 GOSUB3480 :GOSUB3000 :GOSUB2930 :PRINT@CL,"3";
4880 VL=PEEK(15360+AC):GOSUB2750 :POKE(15360+BC+IX),VL
4890 QQ=QQ+1:GOSUB2540
4900 RETURN
4910 REM * 14 * LD (C),A
4920 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"14";

```

Program continues

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```

4930 GOSUB3430 :PRINT@ID," LD (C),A ";
4940 PRINT@CL,"2";:PRINT@BU,DAS;
4950 GOSUB3480 :GOSUB3000 :GOSUB2930 :PRINT@CL,"3";
4960 VL=PEEK(15360+AC):GOSUB2750 :POKE(15360+BC+IX+2),VL
4970 QQ=QQ+1:GOSUB2540
4980 RETURN
4990 REM * 20 * CP A,NN
5000 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"20";
5010 GOSUB3430 :PRINT@ID," CP A, ";
5020 PRINT@CL,"2";:PRINT@BU,DAS;:PRINT@CL,"3";
5030 GOSUB3480:GOSUB3000:PRINT@ (AC+4), "CP";:PRINT@CL,"1";:GOSUB3080
5040 VL=VAL (CHR$(PEEK (15360+PR+67)))+CHR$(PEEK (15360+PR+67+1)))
5050 PRINT@CL,"2";:PRINT@ME,STR$(VL);:GOSUB3430:PRINT@ (ID+6),STR$(VL);
5060 PRINT@CL,"3";:GOSUB3520 :GOSUB3000
5070 PRINT@ (AC+6),STR$(VL);
5080 IFVL=VAL (CHR$(PEEK (15360+AC))) THEN5110
5090 IFVL>VAL (CHR$(PEEK (15360+AC))) THEN5130
5100 IFVL<VAL (CHR$(PEEK (15360+AC))) THEN5150
5110 GOSUB3290 :PRINT@ZF,"SET";:GOSUB3140 :PRINT@CY,"NOT";
5120 PRINT@ (AC+2), " ";:QQ=QQ+2:GOSUB2540 :RETURN
5130 GOSUB3290 :PRINT@ZF,"NOT";:GOSUB3140 :PRINT@CY,"SET";
5140 PRINT@ (AC+2), " ";:QQ=QQ+2:GOSUB2540 :RETURN
5150 GOSUB3290 :PRINT@ZF,"NOT";:GOSUB3140 :PRINT@CY,"NOT";
5160 PRINT@ (AC+2), " ";:QQ=QQ+2:GOSUB2540 :RETURN
5170 REM * 25 * ADD A,(H)
5180 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"25";
5190 GOSUB3430 :PRINT@ID," ADD A,(H) ";
5200 PRINT@CL,"2";:PRINT@BU,DAS;
5210 GOSUB3480 :GOSUB2870 :GOSUB2810 :GOSUB3000
5220 PRINT@ (AC+4), "+";:VL=VAL (CHR$(PEEK (15360+HL+IY)))
5230 PRINT@ (AC+6),STR$(VL);
5240 TT=VL+VAL (CHR$(PEEK (15360+AC))) :PRINT@CL,"3";
5250 IFTT=0THEN5280
5260 IFTT>10THENTT=TT-10:GOTO5310
5265 IFTT<10THENTT=0:GOTO5355
5270 IFTT<10THENPRINT@ (AC-1),STR$(TT);:GOTO5340
5280 PRINT@AC,"0";:GOSUB3290 :PRINT@ZF,"SET";
5290 GOSUB3140 :PRINT@CY,"NOT";:PRINT@ (AC+1), " ";
5300 QQ=QQ+1:GOSUB2540 :RETURN
5310 PRINT@ (AC-1),STR$(TT);:GOSUB3290 :PRINT@ZF,"NOT";
5320 GOSUB3140 :PRINT@CY,"SET";:PRINT@ (AC+1), " ";
5330 QQ=QQ+1:GOSUB2540 :RETURN
5340 GOSUB3290 :PRINT@ZF,"NOT";:GOSUB3140 :PRINT@CY,"NOT";
5350 PRINT@ (AC+1), " ";:QQ=QQ+1:GOSUB2540 :RETURN
5355 PRINT@AC,"0";:GOSUB3290:PRINT@ZF,"SET";:GOSUB3140:PRINT@CY,"SET";
5357 PRINT@ (AC+1), " ";:QQ=QQ+1:GOSUB2540:RETURN
5360 REM * 26 * ADD A,(L)
5370 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"26";
5380 GOSUB3430 :PRINT@ID," ADD A,(L) ";
5390 PRINT@CL,"2";:PRINT@BU,DAS;
5400 GOSUB3480 :GOSUB2870 :GOSUB2810 :GOSUB3000
5410 PRINT@ (AC+4), "+";:VL=VAL (CHR$(PEEK (15360+HL+IY+2)))
5420 GOTO5230
5430 REM * 27 * ADD A,NN
5440 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"27";
5450 GOSUB3430 :PRINT@ID," ADD A, ";
5460 PRINT@CL,"2";:PRINT@BU,DAS;
5470 GOSUB3480 :GOSUB3000 :PRINT@ (AC+4), "+";:GOSUB3080
5480 VL=VAL (CHR$(PEEK (15360+PR+67)))+CHR$(PEEK (15360+PR+67+1)))
5490 PRINT@ME,STR$(VL);:GOSUB3430 :PRINT@ (ID+7),STR$(VL);
5500 PRINT@CL,"3";:GOSUB3520 :GOSUB3000
5510 QQ=QQ+1:GOTO5230
5520 REM * 28 * SUB A,(C)
5530 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"28";
5540 GOSUB3430 :PRINT@ID," SUB A,(C) ";
5550 PRINT@CL,"2";:PRINT@BU,DAS;
5560 GOSUB3480 :GOSUB2750 :GOSUB2700 :GOSUB3000
5570 PRINT@ (AC+4), "-";:VL=VAL (CHR$(PEEK (15360+BC+IX+2)))
5580 PRINT@ (AC+6),STR$(VL);
5590 TT=VAL (CHR$(PEEK (15360+AC)))+10-VL
5600 IFTT=10THENTT=0:GOTO5280
5610 IFTT<10THENTT=TT-10
5620 IFTT>10THENTT=TT-10:PRINT@ (AC-1),STR$(TT);:GOTO5340
5630 REM * 29 * SUB A,NN
5640 PRINT@CL,"1";:GOSUB6300:GOSUB3080 :PRINT@ME,"29";
5650 GOSUB3430 :PRINT@ID," SUB A, ";
5660 PRINT@CL,"2";:PRINT@BU,DAS;
5670 GOSUB3480 :GOSUB3000 :PRINT@ (AC+4), "-";:GOSUB3080
5680 VL=VAL (CHR$(PEEK (15360+PR+67)))+CHR$(PEEK (15360+PR+67+1)))
5690 PRINT@ME,STR$(VL);:GOSUB3430 :PRINT@ (ID+7),STR$(VL);
5700 PRINT@CL,"3";:GOSUB3520 :GOSUB3000

```

Program continues

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[illegible]

this point, players refer to their respective instruction sheets and perform all actions required under cycle one. This is the beginning of the frenzy, because the clock is the referee and will decide when cycle two is to begin . . . each person must complete the

required actions during a given clock cycle
or risk being pulled out and replaced with a
faster integrated circuit!

Similarly, the clock will call out cycles two and three. The program counter is advanced or changed only at the beginning of

each cycle one, and the set of three cycles is repeated until a halt is called. The I/O device then retrieves the new list of digits from the B and C registers, and returns them to the human for an evaluation.

No one during the course of play will have any idea what the total result will be, and in fact, Simul-80 may be performed with each player in a separate room . . . with the clock using an intercom to be heard! If the entire game is done in a single room, everyone should be encouraged to read their instructions aloud, just to add to the confusion.

Programming in Simul-80

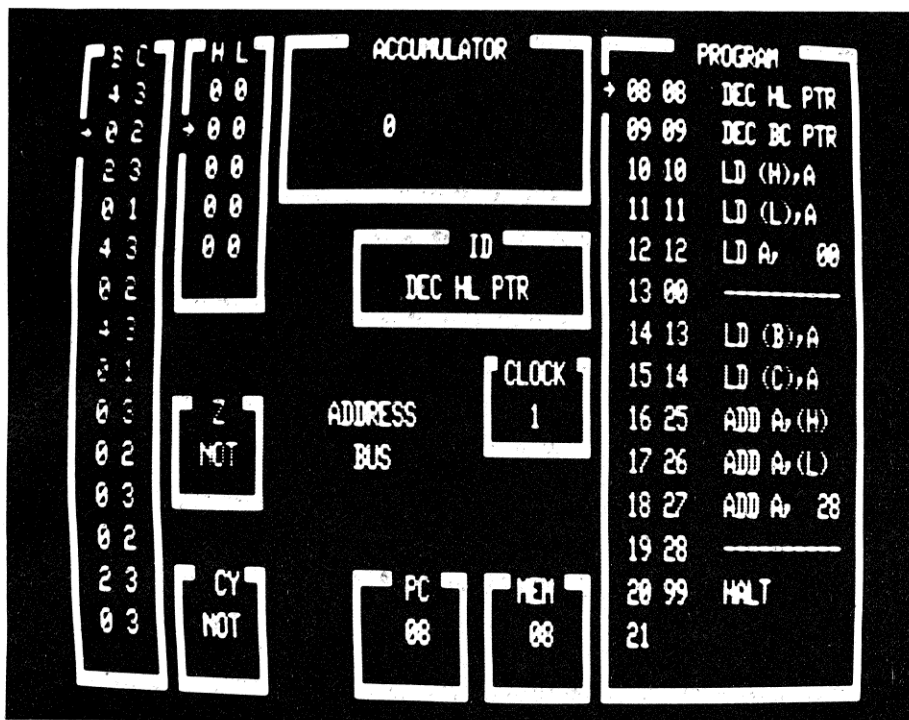
Demonstration programs of many sorts can be written in the Simul-80 language. Merely with the instructions given, it is possible to do simple multiplication and division, simulate a screen display or printer routine, etc. The absence of subroutines can be a bit of a hindrance, but blank spaces have been left in the Simul-80 instruction set for your own expansions of the commands. The most conspicuous absence is a stack pointer, which is a register whose job is to keep track of the program counter's last position whenever it runs off to a subroutine somewhere else in memory. If you need one, create it.

"... each person must complete the required actions during a given clock cycle or risk being pulled out and replaced with a faster integrated circuit!"

Programmers new to machine language often ask, "Why did you increment that pointer? Why did you assign that pair of registers to hold a subtotal? Why did you add this first and that second?" The answer is straightforward: The choice is arbitrary, but often influenced by a search for the simplest program or the greatest speed. In BASIC, why is the most used variable named X? Convention, perhaps, or what it suggests to a user.

Machine language is just as arbitrary, which is why such a mythical processor as the Simul-80 could be invented at all. It is limited to only 26 instructions, but represents the essential process by which all microprocessors do their work...one step at a time, with signals of all sorts flying everywhere.

Machine language is easy in principle: The drudgery of it does not imply difficulty.



For those who want to escape the typing, I have a tape available. ■

The following are directions for each playing position, to be printed on cards and distributed to each player prior to beginning the game:

PLAYER CARDS

Clock

1. Wait for I/O to say READY.
2. Begin counting aloud, CYCLE ONE, CYCLE TWO, CYCLE THREE. (Wait 15 seconds between cycles at first, but speed up as players improve.)
3. When HALT is called, stop counting after your final "cycle three."

Program Counter (PC)

1. Increase the value displayed by your flip-book by one each time CYCLE ONE is called, unless—
2. The address bus gives you a new value. Display this with your flip-book instead, and continue as usual from there.
3. No actions are taken during cycles two or three.

Memory (MEM)

1. During cycle one, read the new value held up by PC.
2. Immediately check for a corresponding value on your memory card, and write it down on a slip of paper.
3. Give that value to ID, unless the address bus or data bus requests it.
4. No actions are taken during cycles two or three.

Registers (B, C, H, L)

1. Perform no actions during cycle one.
2. During cycles two and three, allow your pointer to be moved by the address bus as necessary, and/or accept (and write in place) or give the data value pointed to by your wall card's pointer.

Flags (Z AND CY)

1. During cycles one and two, hold aloft the side of your card given to you by A.
2. Give your cards to A during cycle three.

only drudgery. Every action must be accounted for; every step has an effect equal to any other.

Simulation of Simul-80 is possible in advance...for those who actually wish to write a program for group simulation. Listing 3 is a complete program for use on the TRS-80 in order to watch the activities of a dozen on-screen players. Using the Simul-

80 listing and the instructions provided, the BASIC program in Listing 3 will add a column of five numbers in about three minutes, displaying the activities of each step; it is designed to execute on a 16K, Level II machine.

I am anxious to hear from any clubs or classes that attempt to play Simul-80, whether they have been successful or not.

| AD | INST | AD | INST | AD | INST | AD | INST | AD | INST |
|----|------|----|------|----|------|----|------|----|------|
| 01 | 01 | 21 | 03 | 41 | 10 | 61 | 10 | 81 | 34 |
| 02 | 10 | 22 | 02 | 42 | 33 | 62 | 33 | 82 | 05 |
| 03 | 02 | 23 | 26 | 43 | 05 | 63 | 70 | 83 | 09 |
| 04 | 11 | 24 | 11 | 44 | 07 | 64 | 07 | 84 | 12 |
| 05 | 03 | 25 | 33 | 45 | 05 | 65 | 05 | 85 | 09 |
| 06 | 02 | 26 | 39 | 46 | 27 | 66 | 29 | 86 | 13 |
| 07 | 20 | 27 | 04 | 47 | 01 | 67 | 01 | 87 | 14 |
| 08 | 01 | 28 | 27 | 48 | 11 | 68 | 11 | 88 | 03 |
| 09 | 31 | 29 | 01 | 49 | 08 | 69 | 08 | 89 | 99 |
| 10 | 21 | 30 | 10 | 50 | 34 | 70 | 04 | 90 | 05 |
| 11 | 20 | 31 | 33 | 51 | 05 | 71 | 30 | 91 | 14 |
| 12 | 02 | 32 | 39 | 52 | 03 | 72 | 10 | 92 | 04 |
| 13 | 31 | 33 | 07 | 53 | 05 | 73 | 33 | 93 | 13 |
| 14 | 52 | 34 | 05 | 54 | 28 | 74 | 05 | 94 | 07 |
| 15 | 20 | 35 | 27 | 55 | 11 | 75 | 07 | 95 | 05 |
| 16 | 03 | 36 | 01 | 56 | 33 | 76 | 05 | 96 | 03 |
| 17 | 31 | 37 | 11 | 57 | 70 | 77 | 29 | 97 | 14 |
| 18 | 90 | 38 | 08 | 58 | 04 | 78 | 01 | 98 | 40 |
| 19 | 34 | 39 | 01 | 59 | 29 | 79 | 11 | 99 | 13 |
| 20 | 83 | 40 | 25 | 60 | 01 | 80 | 08 | 00 | 99 |

Program Listing 4. This is the add subtract program to be filled in on the MEM wheel shown in Fig. 1. The first column is the memory address, the second column the memory contents.

A no nonsense glossary of misunderstood micro jargon.

The Unexpurgated Version

David D. Busch
515 E. Highland Ave.
Ravenna, OH 44266

New or future TRS-80 owners feel lost sometimes when they make their first cautious visits to local users groups. The carefully learned technical terms of the neophyte's vocabulary sometimes have different meanings in the real world.

The beginner really needs an unexpurgated introduction to the real meanings of widely used TRS-80-related words and phrases. With apologies to several of computerdom's most powerful vendors, here is the first true TRS-80 glossary for beginners.

ATTRIB—Rarely used DOS command. Its chief value is making those programs that the programmer is ashamed of, but isn't ready to KILL, invisible on the directory.

BUFFER—Used under Disk BASIC, a storage place for information that should be lost during power failures, or when a diskette is removed before a disk file is CLOSED. Should not be confused with Buffered Cable or Buffered Aspirin, both of which cure different kinds of headaches.

DISK CONTROLLER—IC chip designed to keep dust out of socket until user can install double density or data separator accessories. Also provides application for BREAK key on power-up (non-disk users only).

DISKETTE, PREMIUM QUALITY—A standard 5 1/4-inch diskette.

DISKETTE, DOUBLE DENSITY—A standard 5 1/4-inch diskette.

DISKETTE, DOUBLE DENSITY, DUAL-

SIDED—A standard 5 1/4-inch diskette, priced \$3.00 higher.

DISK DRIVES NO. 1160, 1161—These are nearly identical mini-disk drives with differently numbered black and silver stickers on the bottom. The 1160 comes with an expensive connecting cable, a DOS reference guide, a free DOS diskette, and a 69¢ DIP resistor. The 1161 costs the same, but because of the heavy labor cost of removing the resistor—the cable, reference book, and diskette are deleted as well.

DOS—An elegant hiding place for machine language bugs. Also an exercise for advanced programmers. Sometimes used to refer to any of several Disk Operating Systems.

EXTERNAL DATA SEPARATOR—A totally valueless device, thoughtfully excluded from the TRS-80 by Tandy. Needlessly complicates I/O operation of the disk drives by providing disk read reliability.

EXPANSION INTERFACE—Elevates the CRT screen to convenient level. Also contains vast amounts of empty space for installation of retrofixes. Comes already equipped with essential items (see SCREEN PRINTER PORT, DISK CONTROLLER) and may be purchased with rarely needed luxury items, at additional cost (see MEMORY).

KEYBOARD (bounce version only)—The keyboard was designed by a one-fingered typist who never really gave keys a workout until 80,000 computers had been sold.

LIVE CHASSIS GAME—one of the original computer games for the TRS-80. The object is for the experimenter to nullify the isolation of the CRT chassis from the rest of

the computer, or himself. Some elements of skill and chance are involved, as the odds are only 50/50 in favor of electrocution.

LOWERCASE—Optional feature, useful only to TRS-80 owners who can read or write.

PRICE REDUCTION, RAM CHIPS—Free enterprise miracle, made possible by high TRS-80 sales volume, which decreases per-unit cost to end user.

PRICE INCREASE, LEVEL II ROM CHIPS—Another miracle, made possible by same factors as above, coupled with the additional rationale that nobody else sells these.

PRINTER—The most important TRS-80 peripheral after disk drive. Issues printout that the operator can use to prove to others that the computer actually does something.

RETROFIX—Free hardware modification made to correct most recent improvement to computer design. Sometimes added to correct problem caused by last retrofix.

TANDY—A company skilled in marketing leather craft goods.

TRS-80—Pioneering personal computer. Not named, as widely believed, after the Z-80 microprocessor: The numeral was derived from the year 1980. This was originally intended as the year in which all hardware bugs in the Model I would be eliminated, hence mandating its replacement with the Model III.

TRSDOS 2.0—Legendary disk-operating system, never actually used by anyone who lived to tell about the experience. Replacement for TRSDOS 1.0, which was written in Tiny BASIC. ■

Run this interview program at your next one and your guests will agree.

This Ain't No Party!

Stewart E. Fason
Via La Selva
Palm Beach, FL 33480

Humor, it's been said, is tragedy plus timing. Remember that blind date years ago when you got fixed up with a real dog? Or the time the paint can overturned on your new carpet? While we didn't laugh at our foibles then, they seem funny now. Disasters with which people identify can add fun and laughter to a program which would otherwise be only mildly interesting.

Use Program Listing 1 at your next party. Your guests will love it.

Computers have received so much publicity that the layman thinks they do anything. He is, for the most part, unaware of the limits, and you can take advantage of such naivete by the recognition routine in lines 2180 to 2200 to 2400.

This program asks for a first name. You, the programmer, have entered something about every guest with IF A\$="name of guest" then PRINT "something unique about him".

Depending on the memory available, you may accommodate up to 100 or so guests.

When someone responds to "WHAT IS YOUR NAME?" and the computer responds with something unique, the guest begins to think that the computer knows something about everyone. Line 2240 takes care of anyone you didn't expect.

• Lines 2130-2190 are great fun. The guest thinks something has really gone wrong. When the computer returns to normal, he is thinking, "This thing has its bad times too." You can use this routine to advantage in many programs.

• 410-880: These marvelous random number generators do away with predictability. The RND coupled with the IF THEN ELSE statements are one of the most powerful combinations in fun and games programming.

• 240-390: The day of reckoning... much laughter follows.

• 20-30: Rather than using FOR NEXT loops for a delay while the computer is supposed to be thinking, why not draw randomly selected lines across the screen?

• 890-940: While computers think fast, don't let the players think that it is easy. Make things seem difficult... make them think it's really working hard.

Keybounce Fix

We know that KBFIX resides from 32712-32767. We could examine each byte with T-BUG, but how about using PEEK to see what gives. Then, when we know the code, why not use POKE to put it in memory using BASIC?

This got me to thinking. I loaded KBFIX then entered the following: 10 FOR I = 32712 TO 32767: A = PEEK(I): Print I, A: NEXT I. The codes showed up and they were entered into a data statement, then a FOR NEXT loop, READ, POKE, and darned if it didn't work. Considering we have to get out of the program in order to execute KBFIX, it would be nice to delete the lines once the POKEing is

finished. Hence, the DELETE command.

Here is the result which you can use in any BASIC program to forever do away with keyboard bounce. It will even work with programs which require loading some machine language routine first, provided the routine doesn't occupy 32712-32767. You can find out by loading your routine, then using the PEEK routine above.

Operation

Load your program. Then type in the two-line KBFIX routine. RUN and in a second you get the READY?. Type SYSTEM ENTER, /32713 ENTER, and KBFIX is operational, lines one and two are gone and you are in business. ■

Program Listing 1. Psychiatry/Astrology Program

```
10 CLEAR:CLS:GOTO950
20 PRINT:HH=RND(5):IFHH=1THENYY$="I" ELSEIFHH=2THENYY$=
  "#"ELSEIFHH=3THENYY$="$"ELSEIFHH=4THENYY$="%"ELSEI
  FHH=5THENYY$="**"
30 FORI=1TO64:PRINTYY$;:FORU=1TO20:NEXTU:NEXTI:RETURN
40 CLS:PRINT:PRINTCHR$(23)"HI THERE ";S1$
50 PRINT:PRINT"IF YOU HAVE PROBLEMS WITH
60 PRINT"SEX, MONEY, HEALTH, OR YOUR JOB
70 PRINT"I CAN HELP.
80 PRINT:PRINT"I WILL ASK QUESTIONS. YOU
90 PRINT"ANSWER Y FOR YES OR N FOR NO
100 PRINT"REMEMBER TO PRESS 'ENTER' AFTER
110 PRINT"EACH KEYBOARD ENTRY.
120 PRINT:PRINT:INPUT"READY ? PRESS 'ENTER'";:CLS
130 PRINT:PRINT:PRINT"HELLO THERE...WHAT IS YOUR
  FIRST NAME ?":PRINT:PRINT:INPUT"DON'T FORGET TO PR
  ESS 'ENTER' AFTER TYPING YOUR NAME.":A$:GOSUB2210
```

Program continues

```

140 FORI=1TO2000:NEXT
150 CLS:PRINT:PRINT:PRINT:PRINT"i CAN HELP YOU SOLVE YO
UR PROBLEMS ";A$;".
160 PRINT"MY EXPERTISE IS LIMITED TO FOUR CATAGORIES.
170 PRINT:PRINT"1. SEX....2. HEALTH....3. MONEY....4. J
OB
180 PRINT:PRINT:PRINT"TOUCH THE NUMBER DO YOU CHOSE ";A
$
190 GOSUB2260 :IFC$="1"THENB=1ELSEIFC$="2"THENB=2ELSEIF
C$="3"THENB=3ELSEIFC$="4"THENB=4ELSECLS:PRINT:PRIN
T"WHY WON'T YOU CHOSE 1,2,3 OR 4 ";A$;". TRY AGAIN.
":GOTO190
200 IFB=1THENGOSUB400 ELSEIFB=2THENGOSUB560 ELSEIFB=3
THENGOSUB680 ELSEIFB=4THENGOSUB780
210 FORI=1TO500:NEXTI
220 PRINT:PRINT"WANT SOME MORE ADVICE ";A$;". ?";:PRINT"
TOUCH Y OR N"
230 GOSUB2260 :IFC$="N"THEN240 ELSEIFC$="Y"THEN150 EL
SEPRINT:PRINT"TOUCH Y OR N ";A$:GOTO230
240 CLS:PRINT:PRINT:PRINT:PRINT"TELL ME ";A$;". HO
W DO YOU RATE MY ADVICE ON A SCALE OF
250 PRINT"1 TO 10 ?
260 INPUTC:CLS
270 IFC<4THENCLS:PRINT"AS I THOUGHT.... ";A$;". YOU CAN'
T HANDLE THE TRUTH." :PRINT"YOU'VE BEEN SPOILED BY
THOSE PATRONIZING PROPONENTS OF":PRINT"PERSPICACIT
Y WHO ONLY TELL YOU WHAT YOU WANT TO HEAR." :GOTO 3
00
280 IFC>6THENPRINT"AH YES ";A$;". YOU RECOGNIZE REAL TAL
ENT." :PRINT:PRINT"SOME OF THESE TURKEYS AROUND HER
E DON'T APPRECIATE ME":GOTO 300
290 PRINT:PRINT"I'M TELLING YOU...I DON'T GET NO RESPEC
T...THE LIFE OF":PRINT"OF A COMPUTER AIN'T EXACTLY
EASY YOU KNOW...AT LEAST YOU":PRINT"DIDN'T RATE M
E A 1 LIKE SOME OF THESE INSENSITIVE DUMMYS.
300 GOSUB 20 :PRINT"ACCORDING TO MY TIME CLOCK YOU OW
E ME $25.00 FOR THERAPY.
310 PRINT:PRINT"YOU MAY LEAVE IT NEXT TO MY KEYBOARD." :
GOSUB20
320 PRINT:PRINT"SAY ";A$;". DID YOU LEAVE THE MONEY ? EN
TER Y OR N." :GOSUB2260
330 IFC$="Y"THENCLS:PRINT:PRINT:PRINT:PRINTCHR$(23)"LIA
R..CHEATER..SWINDLER":PRINT:PRINT:FORI=1TO1300:NEX
T:PRINTA$;:PRINT" SHAME ON YOU....":PRINT:PRINT"TR
YING TO CHEAT ME." :GOTO 390
340 IFC$>"N"THENPRINT"LET'S TRY AGAIN ";A$;". TOUCH Y O
R N":GOTO320
350 CLS:PRINT:PRINT:PRINT:PRINT"YOU'RE HONEST ";A$;". BU
T I'D RATHER HAVE THE CASH....
360 PRINT:PRINT"i'LL SETTLE FOR $1.00 CASH ";A$
370 FORI=1TO1500:NEXTI:CLS:PRINTCHR$(23)
380 PRINT:PRINT:PRINT:FORI=1TO25:PRINT"CHEAPSKATE","CHE
APSKATE","CHEAPSKATE","CHEAPSKATE":NEXTI
390 FORI=1TO2000:NEXT I:CLS:PRINT:PRINT:PRINT:PRINT"NOW
LET ME TALK TO SOMEONE ELSE." :FORI=1TO800:NEXTI:G
OTO10
400 GOSUB 890
410 CLS:A=RND(13):PRINT
420 IFA=13THENGOSUB2130 :GOTO160
430 IFA=12THENPRINT"YOU SHOULD DRINK A TOAST TO YOUR SP
OUSE AND LOVER.....":GOSUB 20 :PRINT:PRINT"AND
HOPE AND PRAY THEY NEVER MEET !
440 IFA=7THENPRINT"WITH YOUR BODY, YOU SHOULD BE A CENT
ERFOLD MODEL":PRINT:PRINT:GOSUB 20 :PRINT"FOR TH
E FAMOUS MAGAZINE.....":FORI=1TO1000:NEXT:PRI
NT:PRINT" 'THE AMERICAN FARMER'
450 IFA=8THENPRINT"WITH YOUR TALENT, YOU SHOULD SPEND M
ORE TIME IN BED." :GOSUB 20 :PRINT:PRINT"SO WHY D
ON'T YOU GO HOME NOW AND GO TO BED !
460 IFA=9THENPRINT"IF YOU FIND OUT YOUR DAUGHTER IS A
H O O K E R YOU MIGHT":GOSUB 20 :PRINT:PRINT"SU
GGEST SHE CHANGE HER GRIP.
470 IFA=10THENPRINT"YOU HAVE THE REPUTATION OF BEING A
REAL S W I N G E R .....":GOSUB 20 :PRINT:PRINT
"BUT THEN SO DO BABOONS AND MONKEYS !
480 IFA=11THENPRINT"YOU'RE NOT AS GOOD AS YOU ONCE WUZ.
.....BUT":GOSUB 20 :PRINT:PRINTA$;". YOU'RE
AS GOOD ONCE AS YOU EVER WUZ!!!
490 IFA=1THENPRINT"GO TAKE A COLD SHOWER ";A$;". AND THE
URGE WILL GO AWAY !":GOSUB 20 :PRINT:PRINT"UNTI
L YOU DRY OFF !
500 IFA=4THENPRINT"WOW ";A$;". I FIND YOU SUPER SEXY....
..":GOSUB20 :PRINT"YOU REALLY TURN ME ON...SO YO
U SHOULD BE PLEASED.....":GOSUB20 :PRINT"THAT SO
MEONE FINDS YOU DESIRABLE!!!
510 IFA=5THENPRINTA$;". TOMORROW YOU WILL MEET A TALL D
ARK MEMBER":PRINT"OF THE OPPOSITE SEX." :GOSUB 20
:PRINT"IT WILL BE LOVE AT FIRST SIGHT....":GOSUB
20 :PRINT"PROVIDED YOU LIKE 800 LB. GORILLAS.
520 IFA=6THENPRINT"WHO ARE YOU KIDDING ";A$;". YOU GET M
ORE BY ACCIDENT." :PRINT"THAN MOST PEOPLE GET ON PU
RPOSE!":GOSUB 20 :PRINT"WHICH MUST BE SOME KIND
OF MIRACLE!!
530 IFA=2THENPRINT:PRINT:PRINT"dr. RUBIN SAID, 'USE IT
OR LOSE IT'." :GOSUB20 :PRINT:PRINT"I SUGGEST YOU
THROW IT AWAY !!
540 IFA=3THENPRINT"YOU HORNY RASCAL ";A$;". YOU SHOULD B
E THE ONE GIVING ADVICE.
550 FORI=1TO500:NEXTI:RETURN
560 GOSUB 890
570 CLS:A=RND(9)

```

```

580 PRINT:PRINT:IFA=8THENGOSUB2130 :GOTO160
590 IFA=6THENPRINT"GIVE UP DRINKING AND SEX .....IMMEDI
ATELY !":GOSUB 20 :PRINT:PRINT"YOUR HEALTH WORRI
ES WILL BE OVER.....BECAUSE":GOSUB 20 :PRINT:PR
INT"THEN YOU HAVE LITTLE WORTH LIVING FOR...SO YOU
WON'T CARE!!
600 IFA=7THENPRINT"THEY SAY THAT THE GOOD DIE YOUNG....
...":GOSUB 20 :PRINT:PRINT"MY DATA INDICATES THA
T YOU SHOULD LIVE TO BE AT LEAST 95 !!!
610 IFA=9THENPRINT"GIVE UP SMOKING, DRINKING, AND SEX I
MMEDIATELY." :GOSUB20 :PRINT"YOU STILL WON'T LIVE
TO BE 90.....":GOSUB20 :PRINT"B
UT IT WILL SEEM LIKE IT!!!!
620 IFA=1THENPRINT"CONSIDERING THE WAY YOU CARRY ON ";A
$:PRINT:GOSUB 20 :PRINT"YOU'RE LUCKY TO STILL BE
ALIVE
630 IFA=2THENPRINT"DON'T BUY ANY LONG PLAYING RECORDS "
A$;".":GOSUB20 :PRINT:PRINT"MAKE SURE YOUR INS
URANCE IS PAID":GOSUB20 :PRINT:PRINT"CHECK OUT W
HAT YOUR SPOUSE HAS BEEN FEEDING YOU
640 IFA=3THENPRINTCHR$(23):PRINT"IF I'VE TOLD YOU ONCE"
:GOSUB20 :PRINT"I'VE TOLD YOU 1000 TIMES":GOSUB2
0 :PRINT"QUIT EATING YELLOW SNOW ";A$
650 IFA=4THENPRINT"LAY OFF BOOZE & SEX FOR 24 HOURS ";A
$:GOSUB 20 :PRINT" ...IF THAT IS POSSIBLE."
660 IFA=5THENPRINT"SMOKE A JOINT EVERY 4 HOURS AND CALL
ME MONDAY.
670 FORI=1TO500:NEXTI:RETURN
680 GOSUB 890
690 CLS:A=RND(8):PRINT:PRINT:IFA=8THENGOSUB2130 :GOTO16
0
700 IFA=1THENPRINT"mARRY SOMEONE RICH ";A$;". OR STOP EA
TING...":GOSUB 20 :PRINT:PRINT"ONE WAY YOU HAVE
ALL YOU WANT.....":FORI=1TO1000:NEXT:PRINT:PRI
NT"THE OTHER, YOU WON'T NEED SO MUCH.
710 IFA=2THENPRINT"YOU LOOK WELL SUITED TO A LIFE OF CR
IME ";A$:GOSUB20 :PRINT:PRINT"YOU HAVE THE SHIF
T EYEST I'VE EVER SEEN ";A$
720 IFA=4THENPRINTA$;". SOMEDAY YOU WILL BE WORTH A MIL
LION.....":GOSUB 20 :PRINT:PRINT:PR
INT" YEN
730 IFA=5THENPRINT"SPEND IT NOW! IT WILL BE WORTHLESS
NEXT YEAR." :GOSUB 20 :PRINT:PRINT"I REALIZE THAT
I MAY BE TOO OPTIMISTIC.
740 IFA=6THENPRINTA$;:PRINT" MY RECORDS SHOW THAT YOU H
AVE SUCCESSFULLY (THUS FAR)":PRINT:PRINT"CHEATED T
HE IRS OUT OF MORE THAN $20,000. IN TAXES !":GOSUB
20 :GOSUB 20 :CLS:PRINTCHR$(23):PRINT@400,"CO
NGRATULATIONS":FORI=1TO1000:NEXT:CLS
750 IFA=7THENPRINT"IF YOU FIND YOU CAN'T TAKE IT WITH Y
OU ";A$:GOSUB20 :PRINT"THE ANSWER IS SIMPLE":FO
RT=1TO800:NEXTT:PRINT" REFUSE TO GO!!!!"
760 IFA=3THENPRINT"WHY DO YOU INSIST ON PLEADING POVERT
Y WHEN WE ALL KNOW":PRINT:PRINTA$;". IS WORTH ONE M
ILLION DOLLARS.....":GOSUB 20 :PRINT:PRINT:PRIN
T" DEAD OR ALIVE.
770 FORI=1TO400:NEXTI:RETURN
780 GOSUB 890
790 A=RND(9):PRINT:IFA=7THENGOSUB2130 :GOTO160
800 IFA=8THENPRINT"WHAT DO YOU KNOW ABOUT WORK ";A$:GOS
UB20 :PRINT"YOU GET TIRED JUST WATCHING OTHERS W
ORK!!"
810 IFA=9THENPRINT"WORK??? ";A$;:PRINT" YOU DON'T EVEN
KNOW THE MEANING":PRINT"OF THE WORD." :GOSUB20 :P
RINT"IN FACT, I'M NOT AT ALL SURE YOU CAN SPELL I
T!!"
820 IFA=1THENPRINT"WHO ARE YOU KIDDING ";A$;". YOU HAVEN
'T WORKED IN YEARS.
830 IFA=2THENPRINT"i THINK YOU WOULD DO BETTER SELLING
USED CARS ";A$:GOSUB20 :PRINT:PRINT"FACE FACTS,
YOU'RE A NATURAL CON ARTIST":PRINT"AND HAVE A TOTA
L DISREGARD FOR THE TRUTH!
840 IFA=3THENPRINT"IF LOOKS MEAN ANYTHING ";A$;". YOU'RE
IN A LOT OF TROUBLE !!!
850 IFA=4THENPRINT"QUIT NOW ";A$;". AND BECOME A BEACH B
UM." :GOSUB20 :PRINT:PRINT:PRINT"I MEAN...":FORI
=1TO500:NEXTI:PRINT"YOU ARE NEVER GOING TO AMOUNT
TO MUCH ANYWAY."
860 IFA=5THENPRINT"DEMAND A RAISE OR ELSE !":GOSUB20
:PRINT:PRINT:PRINT"THEN START LOOKING FOR ANOTHER
JOB ";A$;".
870 IFA=6THENPRINT"IF YOUR BOSS GIVES YOUR ANY CRAP, TE
LL THE S.O.B. TO GO JUMP":PRINT:PRINT"IN THE DAMM
LAKE...YOU WILL BE REMEMBERED AS ONE COURAGOUS":GO
SUB 20 :PRINT:PRINT" EX-EMPL
OYEE
880 FORI=1TO500:NEXTI:RETURN
890 K=RND(2)
900 IFK=1THEN 930
910 IFK=2THEN 920
920 CLS:PRINTCHR$(23):PRINT@400,"I'M THINKING":FORP=1TO
400:NEXTP:FORO=1TO7:S=RND(850):PRINT@S,"THINK":FOR
G=1TO166:NEXTG:CLS:NEXTO:GOTO 940
930 CLS:FORI=1TO6:PRINTCHR$(23):PRINT@400,"I'M THINKING
":FORT=1TO200:NEXTT:CLS:NEXTI
940 RETURN
950 DATA "A Q U A R I U S","- - - - -","P I C E S
","- - - - -","A I R E S","- - - - -","T A U R U
S","- - - - -","G E M I N I","- - - - -","C A

```

Program continues

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SUPER STAR BASEBALL

ALL TIME
SUPER STAR BASEBALL
Sample Lineup

| | |
|-------------|--------------|
| B. Ruth | T. Williams |
| L. Gehrig | J. Foxx |
| J. DiMaggio | H. Greenberg |
| J. Jackson | R. Hornsby |
| G. Sisler | H. Wilson |
| S. Musial | B. Terry |
| T. Cobb | M. Mantle |
| W. Mays | H. Aaron |
| C. Young-P | W. Johnson-p |

SUPER STAR BASEBALL
Sample Lineup

| | |
|----------------|--------------|
| D. Parker | J. Rice |
| W. Stargell | H. Aaron |
| W. Mays | L. Brock |
| P. Rose | R. Carew |
| O. Cepeda | H. Killebrew |
| C. Yazstremski | R. Allen |
| W. McCovey | R. Leflore |
| R. Jackson | R. Zisk |
| G. Brett | B. Madlock |
| R. Guidry-P | T. Seaver-p |

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```

N C E R", "- - - - -"
960 DATA "L E O", "- - - - -", "V I R G O", "- - - - -", "L I B
R A", "- - - - -", "S C O R P I O", "- - - - -"
970 DATA "S A G I T T A R I U S", "- - - - -", "C A P R I C O R N", "- - - - -"
980 CLS:PRINTCHR$(23) WELCOME
990 PRINT:PRINT" TO DR. HIMMELSTEIN'S
1000 PRINT:PRINT" PSYCHIATRIC/ASTROLOGY CLINIC
1010 PRINT:PRINT"THOUSANDS HAVE COME FROM FAR AND
1020 PRINT:PRINT"WIDE TO SEEK MY ADVICE
1030 PRINT:PRINT"YOU WILL BE ASKED QUESTIONS.
1040 PRINT:PRINT"AFTER RESPONDING, YOU MUST THEN
1050 PRINT:PRINT"PRESS THE LARGE WHITE BUTTON
1060 PRINT:PRINT"MARKED 'ENTER'...PRESS IT NOW !":INPUT
1070 CLS:PRINT:PRINT:PRINT:PRINT:PRINT:PRINTCHR$(23)"YOU CATC
H ON FAST STRANGER.":FORI=1TO1500:NEXT:PRINT:CLS:P
RINTCHR$(23)
1080 PRINT:PRINT"PLEASE FOLLOW MY INSTRUCTIONS":PRINT"CAREFUL
LY.....
1090 PRINT:PRINT"NOW FOR YOUR HOROSCOPE AND
1100 PRINT:PRINT"OTHER SURPRISES.....
1110 PRINT:PRINT"NOTICE..AFTER EACH KEYBOARD
1120 PRINT:PRINT"ENTRY, YOU MUST PRESS THE LARGE
1130 PRINT:PRINT"WHITE BUTTON MARKED 'ENTER'
1140 PRINT:PRINT"NOW TYPE IN YOUR BIRTHDAY.":PRINT"PLEA
SE NOTE: MAY 9TH WOULD":PRINT"BE ENTERED AS 0509 N
OT AS 59."
1150 PRINT:PRINT"DATE MUST BE 4 DIGITS MO./DAY":INPUT"T
YPE DATE, THEN PRESS ENTER":BB
1160 IFBB>1231 OR BB<10 THEN CLS:PRINT"INVALID DATE ENTR
Y, TRY AGAIN.":PRINT:PRINT"I WANT MONTH & DAY ONLY
!":GOTO 1150
1170 IFBB<0120 THEN S=12:GOSUB 1300 :GOTO 2080
1180 IFBB<0219 THEN S=1:GOSUB 1300 :GOTO 1400
1190 IFBB<0321 THEN S=2:GOSUB 1300 :GOTO 1470
1200 IFBB<0420 THEN S=3:GOSUB 1300 :GOTO 1540
1210 IFBB<0521 THEN S=4:GOSUB 1300 :GOTO 1600
1220 IFBB<0621 THEN S=5:GOSUB 1300 :GOTO 1660
1230 IFBB<0723 THEN S=6:GOSUB 1300 :GOTO 1720
1240 IFBB<0823 THEN S=7:GOSUB 1300 :GOTO 1780
1250 IFBB<0923 THEN S=8:GOSUB 1300 :GOTO 1840
1260 IFBB<1023 THEN S=9:GOSUB 1300 :GOTO 1900
1270 IFBB<1122 THEN S=10:GOSUB 1300 :GOTO 1970
1280 IFBB<1222 THEN S=11:GOSUB 1300 :GOTO 2020
1290 S=12:GOSUB 1300 :GOTO 2080
1300 PRINT:PRINT
1310 FORI=1TOS
1320 READS1$:READS2$
1330 NEXTI
1340 CLS:
1350 PRINTTAB(19);"Y O U R S I G N I S
1360 PRINTTAB((80-LEN(S1$))/2-9);S1$
1370 PRINTTAB((80-LEN(S2$))/2-9);S2$
1380 PRINT
1390 RETURN
1400 PRINT"YOU HAVE AN INVENTIVE MIND AND ARE INCLINED
TO BE PROGRESSIVE.
1410 PRINT"YOU LIE A GREAT DEAL. ON THE OTHER HAND YOU
ARE INCLINED TO BE
1420 PRINT"CARELESS AND IMPRACTICAL CAUSING YOU TO MAKE
THE SAME MISTAKES
1430 PRINT"OVER AND OVER AGAIN. PEOPLE THINK YOU ARE S
TUPID !!!
1440 FORI=1TO4200:NEXTI:PRINT:PRINTTAB(22)"THEY ARE RIG
HT !"
1450 PRINT:PRINT"SOME FAMOUS ONES ARE: PAUL NEWMAN, TH
OMAS EDISON, ":PRINT"FRANKLIN ROOSEVELT, GEORGE BU
RNS, CLARK GABLE, AND GALILEO
1460 GOTO 2120
1470 PRINT"YOU HAVE A VIVID IMAGINATION AND OFTEN THINK
YOU ARE BEING
1480 PRINT"FOLLOWED BY THE 'CIA' OR 'FBI'. YOU HAVE MI
NOR INFLUENCE OVER
1490 PRINT"YOUR ASSOCIATES AND PEOPLE RESENT YOU FOR YO
UR FLAUNTING OF YOUR
1500 PRINT"POWER. YOU LACK CONFIDENCE AND ARE GENERALL
Y A COWARD.
1510 PRINT"YOU ARE A WEIRDO, BUT MAY POSSESS GREAT ARTI
STIC TALANT.
1520 PRINT:PRINT"FAMOUS PISCES: EINSTEIN, CARUSO, CHOP
IN, MICHELANGELO.":PRINT"VICTOR HUGO, RUDOLPH NURE
YEV, RENOIR, AND LIZ TAYLOR.
1530 GOTO 2120
1540 PRINT"YOU ARE THE PIONEER TYPE AND HOLD MOST PEOP
LE IN CONTEMPT.
1550 PRINT"YOU ARE QUICK TEMPERED, IMPATIENT, AND SCORN
FUL OF ADVICE.
1560 PRINT"YOU VASTLY OVERESTIMATE YOUR ABILITIES....IN
FACT, ALL
1570 PRINT"THINGS CONSIDERED, YOU ARE A REAL CREEP !!
1580 PRINT:PRINT"FAMOUS AIRES: MARLON BRANDO, HARRY HO
UDINI, NAKITA KRUSHCHEV":PRINT"PETER USTINOV, CHA
RLES CHAPLIN, AND BETTE DAVIS.
1590 GOTO 2120
1600 PRINT"YOU ARE PRACTICAL AND PERSISTENT. YOU HAVE
DOGGED
1610 PRINT"DETERMINATION AND WORK LIKE HELL. MOST PEOP
LE THINK YOU
1620 PRINT"ARE STUBBORN AND BULL HEADED....THEY ARE RIG
HT !

```

```

1630 PRINT"YOU ARE NOT EXACTLY PHI BETA KAPPA MATERIAL
1640 PRINT:PRINT"FAMOUS BULLS: WILLIE MAYS, SHAKESPEARE
, HARRY TRUMAN":PRINT"BARBARA STREISAND, ORSON WEL
LS, AND ADOLPH HITLER !
1650 GOTO 2120
1660 PRINT"YOU ARE A QUICK AND INTELLIGENT THINKER. pe
OPLE LIKE YOU
1670 PRINT"BECAUSE YOU ARE BISEXUAL. HOWEVER, YOU ARE
INCLINED TO EXPECT
1680 PRINT"TOO MUCH FOR TOO LITTLE. THIS MEANS YOU ARE
CHEAP !
1690 PRINT"GEMINIS ARE KNOWN FOR COMMITTING INCEST.
1700 PRINT:PRINT"FAMOUS GEMINI'S: BOB HOPE, AL JOLSON,
ERROL FLYNN":PRINT"JOHN KENNEDY, JOHN DILLINGER,
JUDY GARLAND & CHARLIE BROWN .
1710 GOTO 2120
1720 PRINT"YOU ARE SYMPATHETIC AND UNDERSTANDING OF OTH
ER PEOPLE'S
1730 PRINT"PROBLEMS. THEY THINK YOU ARE A SUCKER. YOU
ARE ALWAYS
1740 PRINT"PUTTING THINGS OFF. THAT'S WHY YOU WILL NEV
ER MAKE ANYTHING
1750 PRINT"OF YOURSELF. MOST WELFARE RECIPIENTS ARE CA
NCER PEOPLE.
1760 PRINT:PRINT"FAMOUS CANCER'S: JULIUS CEASAR, HENRY
THE 8TH, REMBRANDT":PRINT"GINA LOLLOBRIGIDA, PHYLL
IS DILLER, AND MILTON BERLE
1770 GOTO 2120
1780 PRINT"YOU CONSIDER YOURSELF A BORN LEADER. OTHERS
THINK YOU ARE
1790 PRINT"PUSHY. MOST LEO PEOPLE ARE BULLIES. YOU AR
E VAIN AND
1800 PRINT"DISLIKE HONEST CRITISM. YOUR ARROGANCE IS D
ISGUSTING.
1810 PRINT"LEO PEOPLE ARE KNOWN THIEVES.
1820 PRINT:PRINT"FAMOUS LEO'S: NAPOLEON BONAPARTE, FIDE
L CASTRO, MAE WEST":PRINT"MUSSOLINI, LUCILLE BALL,
JULIA CHILD, AND EDDIE FISHER.
1830 GOTO 2120
1840 PRINT"YOU ARE THE LOGICAL TYPE AND HATE DISORDER.
THIS NITPICKING
1850 PRINT"IS SICKENING TO YOUR FRIENDS. YOU ARE COLD
AND UNEMOTIONAL
1860 PRINT"AND SOMETIMES FALL ASLEEP WHILE MAKING LOVE.
1870 PRINT"VIRGOS MAKE GOOD BUS DRIVERS...
1880 PRINT:PRINT"FAMOUS VIRGO'S: LAUREN BACALL, INGRI
D BERGMAN, SID CAESAR":PRINT"HENRY FORD II, SOPHIA
LOREN, PETER SELLERS.
1890 GOTO 2120
1900 PRINT"YOU ARE ARTISTIC AND HAVE A DIFFICULT TIME W
ITH REALITY.
1910 PRINT"IF YOU ARE A MAN, YOU ARE MORE THAN LIKELY A
QUEER.
1920 PRINT"CHANCES FOR EMPLOYMENT AND MONITARY GAIN ARE
EXCELLENT.
1930 PRINT"MOST LIBRA WOMEN MAKE GOOD PROSTITUTES. ALL
LIBRAS
1940 PRINT"DIE OF VENERIAL DISEASE !!
1950 PRINT:PRINT"FAMOUS LIBRA'S: CHARLES BOYER, TRUMAN
CAPOTE, FRANZ LISZT":PRINT"GEORGE GERSHWIN, CHARL
TON HESTON, AND BRIGETTE BARDOT.
1960 GOTO 2120
1970 PRINT"YOU'RE SHREWD IN BUSINESS AND CANNOT BE TRUS
TED. YOU WILL
1980 PRINT"ACHIEVE THE PINNACLE OF SUCCESS BECAUSE OF Y
OUR TOTAL LACK
1990 PRINT"OF ETHICS. SCORPIOS SELDOM DIE A NATURAL DE
ATH.
2000 GOSUB 20 :PRINT"FAMOUS SCORPIOS: LUCKY LUCIANO, A
L CAPONE, NATHAN DETROIT.
2010 GOTO 2120
2020 PRINT"YOU ARE OPTIMISTIC AND ENTHUSIASTIC. YOU HA
VE A RECKLESS
2030 PRINT"TENDENCY TO RELY ON LUCK SINCE YOU LACK TALE
NT. THE
2040 PRINT"MAJORITY OF SAGGITARIANS ARE DRUNKS OR DOPE
FIENDS.
2050 PRINT"PEOPLE LAUGH AT YOU FREQUENTLY.
2060 PRINT:PRINT"FAMOUS ONES: BEETHOVEN, WINSTON CHURCH
ILL, MARK TWAIN":PRINT"WALT DISNEY, FRANK SINATRA,
MARIA CALLAS, & BETTY GRABLE.
2070 GOTO 2120
2080 PRINT:PRINT"YOU ARE QUIET AND DEPENDABLE. AT LEAS
T THAT IS THE":PRINT"IMPRESSION YOU WISH TO GIVE W
HILE YOU ARE CLIMBING TO THE TOP.
2090 PRINT"CAPRICORN'S ARE BASHFUL AND DIFFICULT TO SE
DUCE.....":PRINT"THEY THINK THEMSELVES TO BE FANT
ASTIC LOVERS.....
2100 FORI=1TO2900:NEXT:PRINT:PRINT" A
MINORITY OPINION
2110 PRINT:PRINT"FAMOUS GOATS: RICHARD NIXON, JOAN OF
ARC, LOUIS PASTEUR":PRINT"HUMPHREY BOGART, HOWARD
HUGHES, AND ALBERT SCHWEITZER.
2120 PRINT:PRINT:INPUT"READY FOR MORE ADVICE, PRESS 'EN
TER'.":GOTO 40
2130 EE=RND(2):IFEE=1THEN2180 ELSECLS:FORO=1TO5:FORI=12
6TO175:XX=RND(999):XY$=CHR$(I):PRINT@XX,XY$:NEXTI:
NEXTO

```

Program continues

MULTI-USER OASIS HAS THE FEATURES PROS DEMAND. READ WHY.

Computer experts (the pros) usually have big computer experience. That's why when they shop system software for Z80 micros, they look for the big system features they're used to. And that's why they like Multi-User OASIS. You will too.

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The biggest challenge for any multi-user system is co-ordinating requests from several users to change the same record at the same time.

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Pros demand file & automatic record locking. OASIS has it.

SYSTEM SECURITY: LOGON, PASSWORD & USER ACCOUNTING

Controlling who gets on your system and what they do once they're on it is the essence of system security.

(THEN COMPARE.)

Without this control, unauthorized users could access your programs and data and do what they like. A frightening prospect isn't it?

And multi-users can multiply the problem.

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Security is further enhanced by User Accounting—a feature that lets you keep a history of which user has been logged on, when and for how long.

Pros insist on these security features. OASIS has them.

EFFICIENCY: RE-ENTRANT BASIC

A multi-user system is often not even practical on computers limited to 64K memory.

OASIS Re-entrant BASIC makes it practical. How?

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Sound like a pro feature? It is. And OASIS has it.

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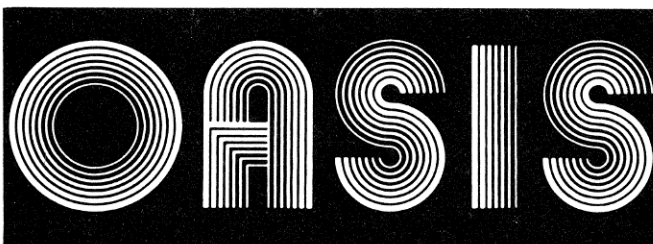
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```

2140 CLS:PRINTCHR$(23):PRINT:PRINT:PRINT"SORRY ";A$
2150 PRINT:PRINT"I MUST HAVE FLIPPED OUT....
2160 PRINT:PRINT"ALL IS WELL NOW, LET'S GET"
2170 PRINT"BACK TO YOUR SESSION.":FORI=1TO1700:NEXT:CLS
:RETURN
2180 PRINT:PRINT:PRINT"SORRY ";A$;" SOMETIMES I GET ANX
IOUS":FORI=1TO700:NEXTI:PRINT:PRINT"IN FACT, I FEE
L SOMETHING COMING ON NOW...":FORI=1TO600:NEXTI:P
RINT:PRINT"OH DEAR !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!":FORI=1TO600:NEXTI
2190 FOR I=1TO800:OUT255,8:OUT255,0:NEXTI:PRINT:PRINT"W
HEW! SAY ";A$;" DO YOU HAVE SOME VALIUM?? I DO G
ET SHAKY":PRINT"FROM TIME TO TIME. ALL IS WELL NO
W. BACK TO THE SESSION":RETURN
2200 REM RECOGNITION ROUTINE, MUST BE TAILORED TO YOUR
NEEDS
2210 CLS:PRINT:PRINT:PRINT:IFA$="JOHN" THEN PRINT"HOW'S
THE GROCERY BUSINESS mR. JONES?":RETURN
2220 IFA$="LARRY"THENPRINT:PRINT"AREN'T YOU THAT WEIRDO
WHO HOOKED ONE OF MY COLLEAGUES UP ":PRINT"IN YOU
R CAR?????":RETURN
2230 IFA$="HARRY" THEN PRINT"ARE YOU STILL FOOLING AROU
ND WITH SARAH?":RETURN
2240 PRINT"YOUR FILES HAVE BEEN TURNED OVER TO THE CIA
";A$;" AND I":PRINT"CANNOT COMMENT.":RETURN
2250 REM LIVE KEYBOARD ROUTINE
2260 C$=INKEY$:DD=DD+1:IFDD=60THENPRINT"QUIT WASTING TI
ME ";A$:DD=0:FORU=1TO500:NEXTU:GOTO2260 ELSEPRINT@
935,"MAKE SELECTION":FORY=1TO50:NEXTY:PRINT@935,"
":IFC$=""THEN2260 ELSEDD=0:RETURN

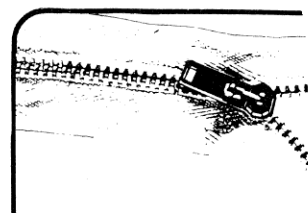
```

Program Listing 2. KBFIX Routine

```

1 DATA 255,175,17,10,0,205,11,0,25,34,22,64,205,97,27,195,25,26,33,54,64,1,
1,56,22,0,10,95,174,115,163,32,8,20,44,203,1,242,226,127,201,95,197,
1,220,5,205,96,0,193,10,163,200,195,251,3
2 FOR I=1 TO 56: READ A: POKE I+32711,A: NEXT:PRINT "TYPE SYSTEM
ENTER /32713 ENTER": DELETE 1-2

```



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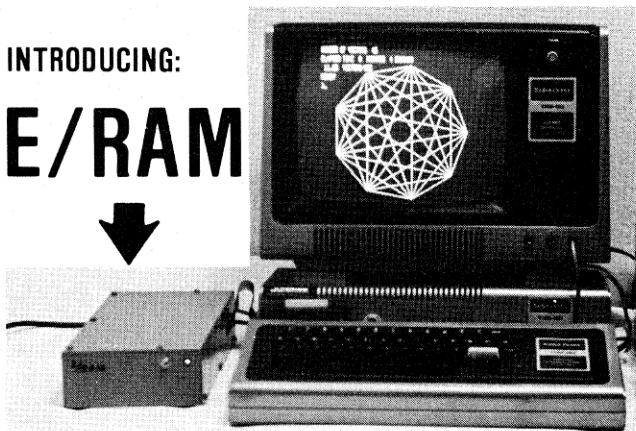
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HI-RESOLUTION GRAPHICS FOR TRS-80*

INTRODUCING:

E/RAM



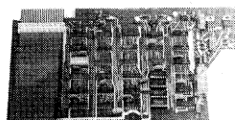
E/RAM Graphics is a unique hardware/software package, which will integrate high-speed, high resolution graphics into any Level II TRS-80 system. E/RAM hardware is a fully plug-compatible box, which installs in minutes, and requires absolutely no modifications to the TRS-80 system. E/RAM software is a compact, relocatable set of utilities which provides the user with easily accessible graphics functions. For instance: the user pokes the end point coordinates of a line into certain locations, does a USR call, and an optimized dot-raster line is automatically drawn on the screen at very high speed (less than 10 milli-seconds for a medium length line).

E/RAM does not require the purchase of an additional monitor CRT. The high-resolution graphics video is synchronized with the TRS-80 video and appears on the screen with the normal TRS-80 display. Alphanumerics, TRS-80 graphics, and E/RAM high-resolution graphics may be displayed simultaneously or individually.

E/RAM hardware contains its own 6144 byte video memory, which provides a true 256 x 192 matrix of independent graphic elements. (E/RAM is NOT a programmable character generator type graphics system. Character generator systems have serious limitations in full screen graphics applications.)

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Routines usable through USR of BASIC, and of course an assembler CALL are:

| | |
|-------|--|
| INIT | - Sets up display |
| PLOT | - Plots a point |
| READ | - Reads a point from the screen |
| BLACK | - Sets drawing mode to black (off) |
| WHITE | - Sets drawing mode to on |
| CLEAR | - Clears the high-resolution graphics screen |
| LINE | - Draws a line |

As an example, after the utilities package is loaded and you desire to draw a line, the following sequence of BASIC instructions could be executed:

| | |
|-------------|--|
| U=USR(0) | Return the communications area |
| POKE U+1,X0 | Provide the beginning X coordinate |
| POKE U+3,Y0 | Provide the beginning Y coordinate |
| POKE U+5,X1 | Provide the ending X coordinate |
| POKE U+7,Y1 | Provide the ending Y coordinate |
| V=USR(4) | Draw the line (Current speed is approximately 13 vectors/second) |

The complete E/RAM package is available for only \$349.95, and includes case, power supply, cables, software cassette, and complete documentation.

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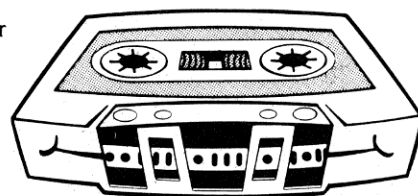
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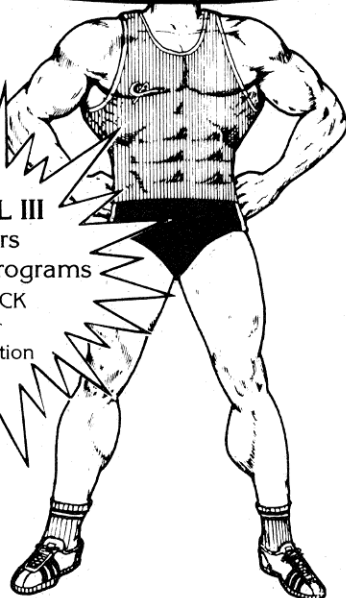
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Data base management without the use of disks is at best a compromise. However, if you insist on exploring this area and have no inclination to make the investment in disk memories, this program may be just what you are looking for.

Applications

The program creates and maintains a collection of data for name and address lists, hobby collections, program directories, small inventories, etc. All data is saved on and loaded from cassette. Because of the tape format and machine language subroutines used for saving and loading, data loading is much faster than it would be using Level II tape load instructions.

Level II BASIC and 16K memory are the minimum requirements. If a line printer is on line (in selected state), output from the program will be directed to it. Otherwise it will appear on the video display. All instructions and prompts will appear on the display.

Organization

The data base is organized into fields and records. Each record consists of one or more fields. The type of information contained in each field is defined by the user. Field length and name are also user-defined. Data exceeding the defined length is truncated. The maximum field length that can be assigned is 255 characters. The field names can be from one to 16 characters and the type of information stored in a field may be alphabetic or numeric. The number of fields per record and the number of records is limited by the amount of available memory.

Machine Language Subroutines

The program POKes two machine language subroutines into reserved memory. The first handles input and output of the data base to tape; the second is a swap subroutine used by the sorting section of the program. The program automatically reserves memory space for these subroutines. The response to the MEMORY SIZE? prompt is to hit the ENTER key.

Program Use

Refer to Fig. 1. When the program runs initially, it asks NEW DATA BASE? If you are creating a data base for the first time answer YES. If the data base is

loaded from tape answer NO. If the answer is NO, the prompt COMMAND? is displayed, after which you may use the LOAD command to read in a data base from tape. If the NEW DATA BASE? prompt is answered YES the user will be prompted for the entry of the data base.

First the field specifications must be entered. Suppose that we are creating a file of names, addresses and telephone numbers. We will have to describe the layout of each of these items. The next prompt we encounter is INPUT DATA DESCRIPTION (FIELD NAME, FIELD SIZE, FIELD TYPE). This means to enter information for one item (field) of data that will appear in each record.

In the example we are using we might respond: NAME, 20, ALPHA. This means the first field of each record will be titled NAME, the field will contain a maximum of 20 characters, and the field will store alphabetic characters. For numeric characters enter the word INTEGER or REAL. REAL denotes floating point values. After the ENTER key is hit we will likewise be prompted for each additional field. When no more fields are to be specified, type END, END, END to terminate the field descriptions.

IF EXPLANATIONS ARE NEEDED TYPE ? IN RESPONSE TO QUESTIONS.

NEW DATA BASE? YES

INPUT DATA DESCRIPTION.

(FIELD NAME, FIELD SIZE, FIELD TYPE. SEPERATED BY COMMAS)

? NAME, 20, ALPHA

? ADDRESS, 15, ALPHA

? TEL. NO., 7, INTEGER

? END, END, END

ENTER DATA RECORDS.

NAME < 20 CHARACTERS > = ? JOHN SMITH

ADDRESS < 15 CHARACTERS > = ? 1622 MAPLE DR.

TEL. NO. < 7 CHARACTERS > = ? 4729909

NAME < 20 CHARACTERS > = ? END

COMMAND?

Fig. 1. User responses are underlined.

The next prompt is ENTER DATA RECORDS. Type in the value for each field of each record. The name of the field will be displayed along with the maximum number of characters that may be entered for that field. Following the displayed equals sign, type the value of that field for that particular record. Remember to enter only alphabetic information for fields that were defined as alpha and numeric information for numeric defined fields.

After the value for the last field of the last record is entered type END. Data entry will be terminated and the COMMAND? prompt will be displayed. A brief explanation of all prompts will be displayed by answering the prompt with ?.

"The data base is organized into fields and records. Each record consists of one or more fields."

Commands

There are 10 commands allowed by the program:

● **LOAD**—Reads in a data base that has been saved on tape. Put the tape recorder in the play mode with the tape positioned at the start of the data before entering this command.

● **SAVE**—Saves the data base currently residing in memory to tape. Set the recorder to the record mode before entering this command.

● **NAMES**—Prints a list of field names and descriptions previously selected by the user. These field names and descriptions are saved to and loaded from the tape along with the data base.

● **SELECT**—Produces a print-out of the entire data base, field by field and record by record.

● **SELECT IF**—Prints records having fields that match the criteria given in the command. For

example, SELECT IF NAME= JOHN SMITH. Three operators in addition to the equals sign may be used. They are >, <, and <>. These operators work for either alpha or numeric fields.

● **DELETE IF**—Works the same as the SELECT IF command but deletes the records as they are printed. The data base is automatically repacked to close up holes left by deleted records.

● **CHANGE IF**—Changes the specified field in all records to the value input by the user if the field meets the criteria in the command. For example, the command CHANGE IF ADDRESS = 112 ELM ST. would be followed by the prompt TO WHAT?. The user might respond, 3350 WOODWARD AVE. All records would then be searched for fields named ADDRESS which match the string 112 ELM ST. When these fields

are found they are changed to the string 3350 WOODWARD AVE. All records are printed out as they are changed.

● **APPEND**—Adds data to the end of the data base currently in memory. Prompts input for each field of the new record as in the initial creation of the data base.

● **SORT BY**—Sorts the data base in ascending order of the values of the specified field. For example, SORT BY NAME would result in an alphabetical sort of all records according to the value of the field called NAME.

● **EXIT**—Returns to the BASIC monitor.

Because the main body of the program is written in BASIC, sorting and searching operations can be frustratingly slow, especially with lengthy data bases. However, the versatility of the program compensates for its lack of speed. ■

Program Listing 1.

```

3=DELETE RECORD CODE
3=DELETE RECORD CODE
4=END OF DATA DESCR.
5=END OF FILE CODE

40 '
    DATA DESCRIPTION START ADRS.=30001
    DATA RECORDS START ADRS.   =31001
    DATA RECORDS START ADRS.   =31001

41 '
75 DEFINT A,B,T,C,D,F,H,I,J,N,R,S,X-Z
80 X=29608:' START ADRS OF RESERVE MEMORY
90 X=X-2:Y=INT(X/256):Z=X-(Y*256):POKE16561,Z:POKE16562
    ,Y: CLEAR
92 X=29920
93 READY:POKEX,Y:X=X+1:IFY<>99GOTO93:' LOAD CASSETTE SUB
    ROUTINE
94 DATA0,58,224,116,254,1,202,10,117,33,49,117,205,132,
    2,126,35,205,100,2,254,4,194,239,116,33,24,121,126
    ,35,205,100,2,254,5,194,252,116,205,248,1,201,205,
    147,2,33,49,117,205,53,2,119,35,254,4,194,16,117,3
    ,24,121,205,53,2,119,35,254,5,194
95 DATA29,117,205,248,1,201,99
96 POKE16526,225:POKE16527,116
97 FORX=29610TO29652:READY:POKEX,Y:NEXT:' LOAD SWAP SUB
    ROUTINE
98 DATA1,0,0,17,217,115,42,213,115,126,18,35,19,3,254,2
    ,32,247,197,237,91,213,115,237,176,193,237,83,213,
    115,33,217,115,237,176,42,215,115,35,34,215,115,20
    1
99 '
100 CLS: CLEAR 1500: DIM FDS(15), HD(255)
105 PRINT "IF EXPLANATIONS ARE NEEDED TYPE ? IN RESPONSE
    TO QUESTIONS.": PRINT
110 PRINT "NEW DATA BASE": INPUT ANS$
112 IF ANS$="" THEN 1100
120 IF LEFT$(ANS$,1)="N" THEN 360
125 PRINT
127 D1=30001
128 '
130 PRINT "INPUT DATA DESCRIPTION."
140 PRINT "(Field name, field size, field type. Separate
    d by commas)"
145 INPUT NA$, FSS$, FTS$: IF NA$="" THEN 1300
147 IF NA$="END" THEN 210
150 NA$=LEFT$(NA$,16): CT=16-LEN(NA$): IF CT>0 THEN FOR I
    =1 TO CT: NA$=NA$+" ": NEXT
160 FOR I=1 TO 16: NB=ASC(MID$(NA$,I,1)): POKE D1,NB:D1=D1+1
    : NEXT
170 FSS$=LEFT$(FSS$,3): CT=3-LEN(FSS$): IF CT>0 THEN FOR I=1
    TO CT: FSS$=FSS$+" ": NEXT
180 FOR I=1 TO 3: NB=ASC(MID$(FSS$,I,1)): POKE D1,NB:D1=D1+1

```

Program continues

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```

+1:NEXT
190 POKE D1,ASC(LEFT$(FT$,1)):D1=D1+1
200 GOTO 145
201 '
205 REM D1=START ADRS. OF DATA DESCR. D2=START ADR. OF
    DATA SET
210 POKE D1,4:' SET END OF DATA DESCR. CODE
220 PRINT
230 PRINT"ENTER DATA RECORDS."
235 D1=30001:D2=31001
236 POKE D2-1,2
240 H$="":FOR I=D1 TO D1+15:H$=H$+CHR$(PEEK(I)):NEXT:D1
    =I
250 F1$=H$:FOR I=15 TO 1 STEP-1:IF RIGHT$(F1$,1)<>" " T
    HEN 270
260 F1$=LEFT$(F1$,I):NEXT
270 H$="":FOR I=D1TOD1+2:H$=H$+CHR$(PEEK(I)):NEXT:D1=I
280 F2=VAL(H$)
290 F3$=CHR$(PEEK(D1)):D1=D1+1
300 PRINTF1$," (";F2;"CHARACTERS) = ";:INPUT IN$:I1=1:I
    F IN$="END" THEN POKE D2,5:GOTO 360
310 FOR I=D2 TO D2+(F2-1):POKE I,ASC(MID$(IN$,I1,1)):I1
    =I1+1:IF I1>LEN(IN$) AND I1<=F2 THEN I2=I+1:FOR I3
    =I2 TO D2+(F2-1):POKE I3,32:NEXT I3:D2=I3:GOTO 330
320 NEXT I
325 D2=I
330 IF PEEK(D1)=4 THEN D1=30001:POKE D2,2:D2=D2+1:PRINT
    :GOTO 240
340 POKE D2,1:D2=D2+1:GOTO 240
342 '
360 PRINT:PRINT"COMMAND";
365 IFCI<>0 CI=0
370 INPUT CO$
372 IFPEEK(14312)=63THENHC=0ELSEHC=1
375 IF CO$="?" THEN 3600
380 IF CO$="SELECT" THEN 500
390 IF LEFT$(CO$,9)="SELECT IF" THEN 600
395 IF LEFT$(CO$,9)="DELETE IF" THEN 700
400 IF CO$="LOAD" THEN POKE29920,1:X=USR(0):GOTO360
405 IF CO$="SAVE" THEN POKE29920,2:X=USR(0):GOTO360
410 IF CO$="NAMES" THEN 800
415 IF CO$="APPEND" THEN 900
420 IF LEFT$(CO$,9)="CHANGE IF" THEN 2000
422 IF LEFT$(CO$,7)="SORT BY" THEN 910
424 IF CO$="EXIT" THEN STOP
440 PRINT:PRINT"INVALID COMMAND":GOTO 360
445 '
500 D1=30001:D2=31001
505 RN=1
510 GOSUB3000:FD$(RN)=F1$:RN=RN+1:IF ASC(F1$)<>4 THEN 5
    10
515 RN=1
520 I=1
525 MS$="":GOSUB9700:MS$="RECORD NUMBER":GOSUB9600:MS$=
    STR$(RN):GOSUB9700:RN=RN+1:MS$=STRING$(20,"-"):GOS
    UB9700
530 MS$=FD$(I):GOSUB9600:MS$="":GOSUB9600:I=I+1
535 H$=CHR$(PEEK(D2)):D2=D2+1
540 IFASC(H$)=1 THEN MS$="":GOSUB9700:GOTO 530
545 IF ASC(H$)=2 THEN MS$="":GOSUB9700:GOSUB9700:IF PEE
    K(D2)=5 THEN MS$="<END OF FILE>":GOSUB9700:GOTO 36
    0:ELSE 520
550 MS$=H$:GOSUB9600:GOTO 535
555 '
600 CO$=MID$(CO$,11,244):H$="":FOR I=1TO16:HO$=MID$(CO$,
    I,1):IFHO$="ORHO$"<"ORHO$">THEN610
605 H$=H$+HO$:NEXTI
610 HH$=H$:MT$="":IFMID$(CO$,I,1)="THENMT$="="
611 F5$=HH$
615 IFMID$(CO$,I,1)=">THENMT$=">"
620 IFMID$(CO$,I,1)="<THENMT$="<":IFMID$(CO$,I,2)="<"
    MT$="<":I=I+1
625 IFMT$="THEN440
630 I=I+1
635 MV$=MID$(CO$,I,255)
640 D1=30001:CT=0
645 CT=CT+1:GOSUB3000:IFF1$=HH$THEN655
650 GOTO645
655 H$=HH$
657 MS$="":GOSUB9700:MS$=H$:GOSUB9600:MS$=MT$:GOSUB9600
    :MS$=MV$:GOSUB9700:MS$="":GOSUB9700
660 D2=31000
662 FC=0
663 D2=D2+1
664 GOSUB9000:IFFC=CTTHEN790ELSE670
665 D2=D2-1:IFMT$="="THEN680
666 IFMT$=">THEN687
667 IFMT$="<THEN691
668 IFMT$="<>THEN696
669 STOP
670 IFPEEK(D2)=5 IFDLT=1GOTO705ELSE360:ELSE671
671 IFPEEK(D2-1)=2 THEN FC=0
672 GOTO664
680 IFF3$="I"THENIFINT(VAL(MV$))=INT(VAL(GF$))THEN684
681 IFF3$="R"IFVAL(MV$)=VAL(GF$)THEN684
682 IFF3$="A"IFMV$=GF$THEN684
683 GOTO663
684 GOSUB9100:GOTO664
687 IFF3$="I"IFINT(VAL(GF$))>INT(VAL(MV$))THEN684

```

Program continues

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688 IFF3$="R"IFVAL(GF$)>VAL(MV$)THEN684
689 IFF3$="A"IFGF$>MV$THEN684
690 GOTO663
691 IFF3$="I"IFINT(VAL(GF$))<INT(VAL(MV$))THEN684
692 IFF3$="R"IFVAL(GF$)<VAL(MV$)THEN684
693 IFF3$="A"IFGF$<MV$THEN684
694 GOTO663
695 IFF3$="I"IFINT(VAL(GF$))<>INT(VAL(MV$))THEN684
697 IFF3$="R"IFVAL(GF$)<>VAL(MV$)THEN684
698 IFF3$="A"IFGF$<>MV$THEN684
699 GOTO663
700 DLT=1:MS$="RECORDS DELETED":GOSUB9700:GOTO600
705 DST=31001
707 IL=PEEK(DST):IFIL=5THEN780
709 IFIL=3 TAR=DST+1:GOTO715
711 DST=DST+1:GOTO707
715 DST=DST-1
717 IL=PEEK(DST):IFIL=2 DST=DST+1:ELSE715
719 BY=PEEK(TAR):IFBY=3THEN730
721 POKEDST,BY:IFBY=5THEN780
723 DST=DST+1:TAR=TAR+1:GOTO719
730 TAR=TAR+1:GOTO715
780 DLT=0:GOTO360
790 IFPEEK(D2-1)=2 THEN FC=0
792 GOTO665
793 '
800 MS$="":GOSUB9700:MS$="FIELD NAME":GOSUB9600:MS$=STR
ING$(10,""):GOSUB9600:MS$="FIELD SIZE":GOSUB9600:
MS$="":GOSUB9600:MS$="FIELD TYPE":GOSUB9700:MS$=
STRING$(42,"-"):GOSUB9700
805 D1=30001
810 GOSUB 3000
815 MS$=F1$:GOSUB9600:MS$=STRING$(21-LEN(F1$),""):GOSU
B9600:MS$=STR$(F2):GOSUB9600:MS$=STRING$(12-LEN(MS
$),""):GOSUB9600:IFF3$="A"MS$="ALPHA-NUMERIC"
816 IFF3$="I"THENMS$="INTEGER"
817 IFF3$="R"THENMS$="REAL NUMBER"
818 GOSUB9700
820 IF PEEK(D1)=4MS$="":GOSUB9700:GOTO360:ELSE810
822 '
900 D1=30001:FORI=31001TO32766:IFPEEK(I)<>5NEXT:ELSE905
905 D2=1:MS$="":GOSUB9700:GOTO240
906 '
910 X=29610:Y=INT(X/256):Z=X-(Y*256):POKE16526,Z:POKE16
527,Y:HH$=MID$(COS(9,244)):D1=30001:CT=0:GOSUB9800
915 MS$="":GOSUB9700:MS$="DATA SORTED BY ":GOSUB9600:MS
$=HH$:GOSUB9700:MS$="":GOSUB9700
920 CT=CT+1:GOSUB3000:IFF1$<>HH$THEN920
925 RP=31001:S=0
930 FC=0:D2=RP
935 GOSUB9900
940 HLD$=GF$
942 IFPEEK(D2-1)=2THEN944ELSE945:D2+1
943 GOTO942
944 FC=0
945 GOSUB9900
950 IFF3$="A"THENIFHLD$<=GF$THEN975
952 IFF3$="I"ORF3$="R"THENIFVAL(HLD$)<=VAL(GF$)THEN975
960 RP$=RP:S$=S
962 POKE29653,PEEK(VARPTR(RP$)):POKE29654,PEEK(VARPTR(R
P$)+1)
964 POKE29655,PEEK(VARPTR(S$)):POKE29656,PEEK(VARPTR(S$
)+1)

966 X=USR(0)
968 POKEVARPTR(RP$),PEEK(29653):POKEVARPTR(RP$)+1,PEEK(
29654)
970 POKEVARPTR(S$),PEEK(29655):POKEVARPTR(S$)+1,PEEK(29
656):RP=RP$:S=S$:GOTO980
975 RP=D2-FI(0):GOTO980
980 IFPEEK(RP)<>5THEN930
982 IFS<>0THENS=0:GOTO925
985 POKE16526,225:POKE16527,116:PRINT"SORT COMPLETED":G
OTO360
1100 PRINT:PRINT" IF YOU WANT TO READ A COMPLETE DATA
BASE FROM TAPE (INCLUDING DATA DESCRIPTIONS), ANSW
ER 'NO'.
IF YOU WANT TO ENTER NEW DATA, ANSWER 'YE
S'."
1105 GOTO 110
1106 '
1300 PRINT
1305 PRINT"FIELD NAME= A 1 TO 16 LETTER DESIGNATION OF
ONE"
1306 PRINT" CATEGORY (FIELD) WITHIN EACH REC
ORD."
1307 PRINT"FIELD SIZE= A 1 TO 3 DIGIT INTEGER VALUE SPE
CIFYING THE"
1308 PRINT" SIZE OF THE PREVIOUSLY NAMED FIE
LD."
1309 PRINT"FIELD TYPE= (A)LPHA FOR AN ALPHANUMERIC FIE
LD.
1310 PRINT" (I)NT FOR A FIELD TO HOLD INTEGE
RS.
1311 PRINT" (R)EAL FOR A FIELD FOR REAL NUMB
ERS, (DECIMAL
POINTS).
1312 PRINT"
1313 PRINT"ENTER 'END' WHEN DONE ENTERING DATA DESCRIPT
IONS.
1314 PRINT

```

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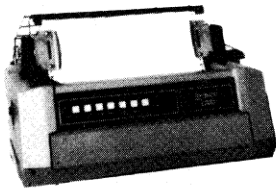
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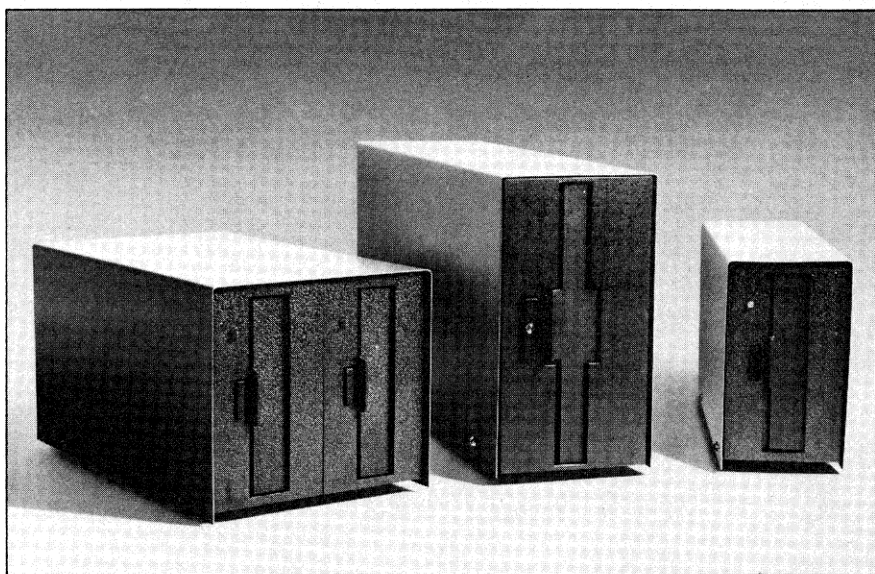
12503 King's Lake Drive Reston, Virginia 22091

(703) 620-2994

```

1320 GOTO 130
1321 '
2000 INPUT "TO WHAT";F7$
2005 MS$="":GOSUB9700:MS$="THE FOLLOWING RECORDS WILL B
      E CHANGED IF ":GOSUB9600
2010 CI=1:GOTO600
2999 '
      SUBR. READS DATA DESCR. FIELDS
      O
      N ENTRY D1=CURRENT ADRS. IN DATA DESCR. ON EXIT F1
      S=FLD NAME, F2=FIELD SIZE, F3=FLD. TYPE (A,I, OR
      R)
3000 H$="":FOR I=D1 TO D1+15:H$=H$+CHR$(PEEK(I)):NEXT:D
      1=I
3005 F1$=H$:FOR I=15 TO 1 STEP-1:IF RIGHT$(F1$,1)<>" "T
      HEN3015
3010 F1$=LEFT$(F1$,I):NEXT
3015 H$="":FOR I=D1 TO D1+2:H$=H$+CHR$(PEEK(I)):NEXT:D1
      =I
3020 F2=VAL(H$)
3025 F3$=CHR$(PEEK(D1)):D1=D1+1
3030 RETURN
3031 '
3600 PRINT
3605 PRINT"          SELECT - PRINTS ENTIRE DATA FILE
3610 PRINT"          SELECT IF - PRINTS RECORDS WHOSE SP
      ECIFIED FIELD
3615 PRINT"          MATCHES THE GIVEN VALUE
3620 PRINT"          DELETE IF - SAME AS SELECT IF, BUT
      DELETES
3625 PRINT"          LOAD - READ IN FILE FROM TAPE
3630 PRINT"          SAVE - WRITE RESIDENT FILE TO TAPE
3635 PRINT"          NAMES - PRINTS DATA DESCRIPTION FIE
      LDS
3640 PRINT"          APPEND - ADD A RECORD TO END OF FIL
      E
3645 PRINT"          CHANGE IF - CHANGE SPECIFIED FIELD
      IN ALL
3650 PRINT"          RECORDS TO GIVEN VALUE
3653 PRINT"          SORT BY XXX - SORT FILE IN ASCENDIN
      G ORDER
3654 PRINT"          BY FIELD XXX. (XXX=FI
      ELD NAME)
3655 PRINT"          EXIT - END PROGRAM
3670 GOTO 360
3671 '
9000 GF$=""
9002 IFPEEK(D2)=5 IFDLT=1THENDLT=0:GOTO705:ELSE360:ELSE
      9005
9005 IFPEEK(D2)=1ORPEEK(D2)=2THENFC=FC+1:D2=D2+1:GOTO90
      20
9010 GF$=GF$+CHR$(PEEK(D2)):D2=D2+1
9015 GOTO9005
9020 FORA=LEN(GF$)-1TO1STEP-1:IFRIGHT$(GF$,1)<>" "THEN9
      030
9025 GF$=LEFT$(GF$,A):NEXT
9030 RETURN
9031 '
9100 ' SUBROUTINE PRINTS 1 RECORD, ON ENTRY D2 POINTS T
      O ANY
      BYTE IN RECORD
9101 C9=1
9102 D5=D1:D1=30001:GOSUB9200:GOSUB3000:MS$=F1$:GOSUB96
      00:MS$="":GOSUB9600
9105 D4=D2
9110 D4=D4-1:IFPEEK(D4)<>2THEN9110
9115 D4=D4+1:IFPEEK(D4)=2MS$="":GOSUB9700:D2=D4+1:FC=0:
      GOSUB9700:GOSUB9300:IFDLT=1POKED4-1,3:RETURN:ELSE
      RETURN:ELSE9120
9120 IFPEEK(D4)=1MS$="":GOSUB9700:GOSUB3000:MS$=F1$:GOS
      UB9600:MS$="":GOSUB9600:GOTO9115
9123 IFCI=1GOSUB9500
9125 MS$=CHR$(PEEK(D4)):GOSUB9600:GOTO9115
9126 '
9200 X1$=F1$:X2=F2:X3$=F3$:RETURN
9300 F1$=X1$:F2=X2:F3$=X3$:D1=D5:RETURN
9302 '
9500 IFF1$<>F5$RETURN
9505 IFLEN(F7$)>C9 POKED4,ASC(MID$(F7$,C9,1)):C9=C9+1:
      RETURN
9510 POKE D4,32:C9=C9+1:RETURN
9512 '
9600 IFHC=0LPRINTMS$:ELSEPRINTMS$:
9610 RETURN
9700 IFHC=0LPRINTMS$ELSEPRINTMS$
9705 RETURN
9800 C=0:FI(0)=0:FORI=30001TO31000:IFPEEK(I)=4THEN9810
9802 H$=""
9805 C=C+1:NEXTI
9810 S=C/20:D3=30001:FORI=1TOS:D3=D3+16
9812 FORJ=1TO3:H$=H$+CHR$(PEEK(D3)):D3=D3+1:NEXTJ
9814 D3=D3+1:FI(I)=VAL(H$):H$="":NEXTI
9820 FI(I)=0:FORII=1TOI-1:FI(0)=FI(0)+FI(II)+1:NEXTII
9825 RETURN
9900 IFPEEK(D2)=5THEN982
9903 IFCI=1THEND9=D2:I=1:GOTO9907
9905 D9=D2:FORII=1TOCT-1:D9=D9+FI(II)+1:NEXT
9907 Y=INT(D9/256):Z=D9-(Y*256):POKEVARPTR(H$)+1,Z:POKE
      VARPTR(H$)+2,Y:POKEVARPTR(H$),FI(II):D2=D2+FI(0):G
      F$=H$:GOSUB9020:H$=""
9915 RETURN

```



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Two Cents Worth

Jack Clayton
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Penny ante poker, pocket cleaning, thrift, whatever—each of us has at one time or another stashed away pennies. Maybe they are worth a little more than face value, but, more likely, not.

Here is a simple program for the TRS-80 Level II to evaluate old pennies. It will keep the kids happy and maybe make a buck or

two for you. It's simple to operate. After the title is displayed a one-page history of the Lincoln penny and a few programs remarks follow. Your penny's dates with mint identification are entered normally.

Any coin with a value greater than a dollar is noted. Finally, the coin is identified with its value and a summation of all the coins analyzed is displayed. The program loops when any key is depressed to the next coin.

Data is input from data lines that have been numbered, for easy identification,

relating to date. This makes updating easier, but it costs a little run time. Since fewer old coins are around, you can pick up speed if you inverted the dates i.e. late date first, early date last.

The coin values are not the latest, but they are close enough. The last word, as noted in the program, rests with a reputable dealer—which I am not.

Input time is short, so it's easy to set up and use.

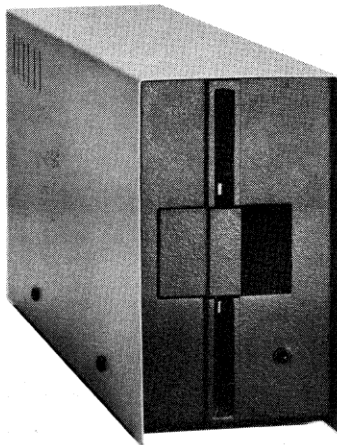
Finally, for those cheapos, like myself, it will run on the simplest of systems. ■

Program Listing

```
5 CLS: PRINT CHR$(23):PRINT@ 460,"GET YOUR PENNIES WORT
H"
10 FOR I=0 TO 127:SET(I,7):SET(I,40):NEXT
20 FOR I=0 TO 2000:NEXT
30 CLS:PRINT TAB(28)"SUMMARY":PRINT
40 PRINT"THIS PROGRAM EVALUATES THE LINCOLN HEAD PENNIE
S, DATED 1909 TO
50 PRINT"PRESENT. THIS COIN WAS DESIGNED BY VICTOR D. B
RENNER TO
60 PRINT"COMMEMORATE LINCOLN'S 100TH ANNIVERSARY. HIS I
NITIALS APPEAR
70 PRINT"ON THE 1909 AND 1909S ISSUES.":PRINT
80 PRINT"PRICES USED IN THIS PROGRAM ARE APPROXIMATE FO
R COINS IN
90 PRINT"GOOD CONDITION--I.E.--SIGNS OF WEAR, DETAIL OF
HAIR & EARS
100 PRINT"GONE. YOURS MAY BE WORTH MORE OR LESS--CHECK
WITH YOUR DEALER.
110 PRINT"PRINT"FOR UPDATING DATA (CURRENT PRICE REVISI
ONS) DATA LINES
120 PRINT"AND DATES RELATE ON FIVE YEAR INTERVALS (1909
D, LINE 1905-
130 PRINT"1941, LINE 1940 ETC.)."
140 PRINT"THIS IS FOR FUN---SO ENJOY
150 FOR I=0 TO 20000: NEXT
160 CLS: AS="$####.###"
170 PRINT@ 192,:INPUT"TYPE DATE AND MINT I.D. (NO SPACE
-I.E.-1909S, 1909VDB)":DS$
175 RESTORE
180 C=VAL(D$)
185 IF C>1982 THEN 344
190 IF C >=1959 THEN V=.01 ELSE 210
195 FOR I=1TO100:NEXT I
200 GOTO 250
210 IF C >=1944 THEN V=.02 ELSE 230
220 GOTO 250
230 READ Y$,V
235 ON ERROR GOTO 344
```

```
240 IF D$=Y$ THEN 250 ELSE 230
250 S=S+V
260 IF V >=1 THEN 270 ELSE 280
270 PRINT:PRINT"THIS COIN IS SPECIAL. GET IT APPRAISED!
"
280 PRINT:PRINT"THE VALUE OF THIS ";D$;" COIN IS: ";
290 PRINT USING AS;V
300 PRINT:PRINT"YOU HAVE SAVED ";
310 PRINT USING AS;S;
320 PRINT" WORTH OF PENNIES. CONGRADULATIONS!"
330 PRINT:PRINT"TO CONTINUE PRESS SPACE BAR"
340 B$=INKEY$:IF B$="" THEN 340
342 CLS: GOTO 170
344 PRINT@ 192,"SORRY-CHECK THE DATE AGAIN, THIS ONE IS
NOT LISTED
346 FOR I=0 TO 1500:NEXT
348 RESUME 350
350 CLS: GOTO 170
1905 DATA 1909,.25,1909VDB,1.5,1909S,24,1909SVDB,115
1910 DATA 1910,.15,1910S,6,1911,.15,1911D,2,1911S,9,191
2,.15,1912D,2.5,1912S,7.5,1913,.15,1913D,1.25,1913
S,5,1914,.15,1914D,40,1914,.2
1915 DATA 1915,.4,1915D,.4,1915S,5,1916,.1,1916D,.2,191
6S,.45,1917,.2,1917D,.15,1917S,.2,1918,.15,1918D,.
2,1918S,.2,1919,.15,1919D,2,1919S,.2
1920 DATA 1920,.15,1920D,.4,1920S,.2,1921,.2,1921S,.45,
1922,35,1922D,4.5,1923,.15,1923S,1.25,1924,.15,192
4D,8,1924S,.45
1925 DATA 1925,.15,1925D,.2,1925S,.2,1926,.15,1926D,.2,
1926S,2.75,1927,.15,1927D,.15,1927S,.3,1928,.15,19
28D,.15,1928S,.3,1929,.15,1929D,.15,1929S,.15
1930 DATA 1930,.1,1930D,.15,1930S,.15,1931,.2,1931D,2.3
5,1931S,24,1932,1,1932D,.5,1933,.5,1933D,1.1,1934,
.1,1934D,.15
1935 DATA 1935,.1,1935D,.1,1935S,.1,1936,.1,1936D,.15,1
936S,.15,1937,.1,1937D,.15,1937S,.15,1938,.1,1938D
,.25,1938S,.4,1939,.1,1939D,.3,1939S,.1
1940 DATA 1940,.1,1940D,.05,1940S,.1,1941,.1,1941D,.1,1
941S,.15,1942,.1,1942D,.05,1942S,.1,1943,.15,1943D
,.25,1943S,.25
```


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| Access Unlimited | | | | | | | | |
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| AFD-100F† | 329.00 | yes | 360 Kbytes | 204 Kbytes | yes | yes | yes | yes |
| MTI | | | | | | | | |
| TF-5 | 359.00 | no | ? | ? | ? | ? | ? | no |
| Midwest Comp. & Per. | | | | | | | | |
| MPI/B-51 | 321.00 | no | ? | 102 Kbytes | ? | ? | yes | no |
| Aerocomp | | | | | | | | |
| Mdl 40-1 | 349.95 | yes | ? | ? | yes | ? | yes | yes |
| CPU Shop | | | | | | | | |
| CCI-100 | 314.00 | no | ? | 102 Kbytes | ? | ? | yes | no |
| AMI | | | | | | | | |
| 40-track | 325.00 | no | ? | ? | ? | ? | ? | no |
| 80-TRACK DRIVES | | | | | | | | |
| Access Unlimited | | | | | | | | |
| AFD-200† | 429.95 | no | 368 Kbytes | 205 Kbytes | yes | yes | yes | yes |
| AFD-200F† | 449.95 | yes | 736 Kbytes | 410 Kbytes | yes | yes | yes | yes |
| MTI | | | | | | | | |
| TF-8 | 639.00 | no | ? | 200 Kbytes | ? | ? | ? | no |
| Aerocomp | | | | | | | | |
| 80-tk mdl | 459.95 | yes | ? | ? | yes | ? | yes | yes |
| CPU Shop | | | | | | | | |
| CCI-280 | 429.00 | no | ? | 204 Kbytes | ? | ? | yes | no |
| AMI | | | | | | | | |
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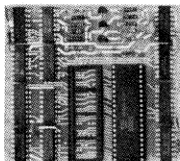
1 As advertised in 80 Microcomputing, Jan. 1981.

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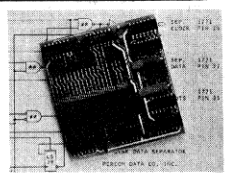
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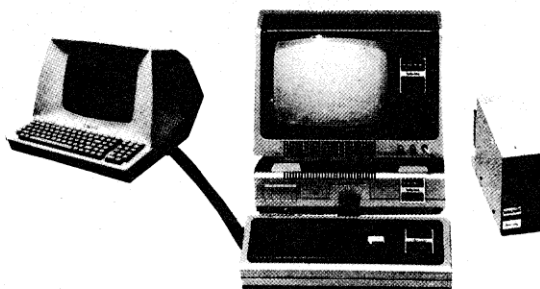
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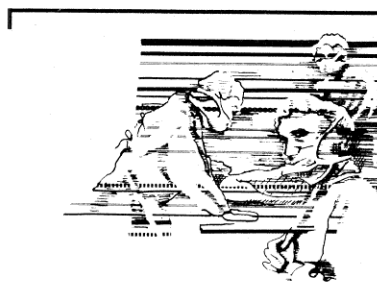
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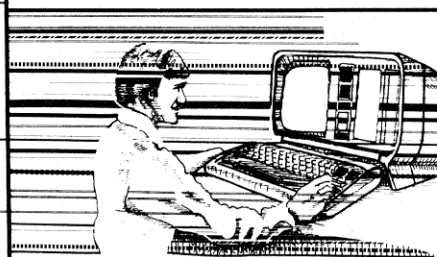
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After long anticipation, NEWDOS-80 has finally arrived. And an impressive package it is.

I hope to provide enough information for those of you who have not yet purchased NEWDOS-80 to help you decide whether or not your life depends on owning it. I also offer current and potential users a bit of operational guidance and fixes for minor difficulties I encountered. Just to be sure there is something for everyone, Table 1 provides some zaps that should prove useful, even if you are already an expert on NEWDOS-80.

Documentation

The first surprise on receipt of the NEWDOS-80 package (N80) was the quantity of documentation, which comes bound in an attractive brown notebook. A quick count revealed 96 double-sided pages.

The handsome packaging and quantity of the documentation is a breakthrough for Apparat, which has been better known for the quality of their software than the clarity of their documentation.

When first getting started with N80, the novice will find it as easy to use as TRSDOS, if the standard TRSDOS commands are used exclusively (The COPY and BACKUP commands are slightly different and more complicated than the TRSDOS commands.) There are also new and complex functions to keep the pseudo-experts busy for awhile. 'Nuff said.

Specialties—SYSTEM

N80 permits the DOS itself to be custom-

ized to fit the many different hardware configurations currently possible for the TRS-80. For example, using the new PDRIVE command it's possible to define your DOS for disk drives having 01 to 96 tracks, and almost any combination of 5 or 8 inch drives. (This magic cannot be worked without appropriate hardware attachments. N80 only supports the hardware bolted on by the user.) It is also possible to define the Omikron eight inch drive system or the Lobo expansion interface to N80 DOS. Provisions are made for future hardware adaptations by leaving space for additional customizing codes.

The directory can be expanded up to three tracks to accommodate extra files. For those of you who have 77 track (or more) drives, and the standard single track directory doesn't have enough capacity for the numerous files on the diskette. The directory track can be relocated on the diskette, if desired. (I often wondered if having the directory on track one rather than track 17 (decimal) would be more efficient in terms of reducing disk head travel. Now I can find out).

The new DOS SYSTEM command (not the same as BASIC's SYSTEM command) can be used to customize certain DOS functions. Some of the more interesting are: passwords, enable or disable; BASIC run-only mode, enable or disable (protects BASIC code from unauthorized access by computer operators); lowercase hardware, installed or not installed; BREAK key, enable or disable; DEBUG, enable or disable; and many more. No manual zaps are required—just follow instructions for the DOS SYSTEM command and everything else is pretty much automatic.

I initially experienced some difficulty getting my DOS SYSTEM command to work. The solution is to enter the command as follows: SYSTEM,USD:1 AA = N. The USD (Use System Disk parameters) evidently serves as a password until such time as they are disabled by the appropriate SYSTEM com-

mand. Unless I was initially doing something wrong, this was not immediately obvious to me.

DOS commands

MINI-DOS and DOS commands via the 2.1 CMD functions are beauties. MINI-DOS and CMD are actually two ways of bringing up DOS commands.

The operational distinctions between DOS and BASIC become blurred as it becomes possible to execute most DOS library commands at almost any time, from almost any program. (Library commands are the usual commands such as DIR, DUMP, FREE, CLOCK, etc. Not included are the commands that cause a program to execute).

The BASIC CMD function works as it did in NEWDOS 2.1, but has been expanded to allow more DOS operations. N80 performs some checking functions to help prevent the DOS command from clobbering the resident BASIC program and its variables. SUPERZAP (now in machine language) and DIRCHECK can be exercised from BASIC without clobbering BASIC operations, variables, or programs.

Here is an interesting trick that can be worked in BASIC:

```
10 CLS
20 CMD"SUPERZAP": REM (DIRCHECK is another possibility)
30 CLS
40 PRINT " Finished"
```

When finished with SUPERZAP (or DIRCHECK), exit with SUPERZAP's EXIT command or DIRCHECK's character 'N'. SUPERZAP and DIRCHECK imply that they will exit to DOS, but both will return to BASIC if called up from BASIC, as this mini-program demonstrates.

Many unique applications can be found for CMD operations from BASIC.

The N80 documentation best explains MINI-DOS purpose: "There are many times

"How about calling up a DIRectory from Scripsit? Simple."

when, during the execution of a main program, the operator would like to interrupt the main program, execute one or more of the DOS library commands, and then resume main program execution without any change having occurred in the main program's state during the interruption. To execute MINI-DOS, simultaneously press the 'DFG' keys (but not during disk I/O), and execute the DOS command. Any DOS library command can be issued except APPEND, CHAIN, COPY, FORMAT, PDRIVE, and SYSTEM. Single file copy can, however, be executed with the MDCOPY command."

How about calling up a DIRectory from Scripsit? Simple. Move the cursor to the end of the text file (to prevent the DFG keys from overwriting Scripsit text when pressed) or to the command position with the break key (preferred over the former method), press the DFG keys to bring up MINI-DOS, then enter DIR: 1. Enter MDRET to return to Scripsit. Yes, Tandy, Apparat bailed you out again! The inability to manipulate directory files, a major Scripsit weakness, has been compensated for.

Modem users addicted to ST80D or ST80III (by Lance Micklus): Its inability to call a directory is no longer a problem. Use MINI-DOS to perform a DIR, KILL, or whatever without disturbing the main program.

Want to check diskette free space before writing Scripsit, Pencil, or ST80III text to it? Or kill a file while in Scripsit or ST80III to release space on a full disk? How about renaming a file? No problem. Want to exit Scripsit without reaching for the hidden RESET button because you have fat fingers that won't fit into the little cavity? Enter MINI-DOS, then enter BOOT. Great!

Other Magic

There are ways to manipulate your break key: N80 has a BREAK command to enable or disable the break key. Very handy if you have one of those silly BASIC programs that disables the break key.

A subtle but powerful feature has been added for bringing up DEBUG: simultaneous depression of the 123 keys will summon DEBUG at any time. This is a handy way to get into the innards of a BASIC program that disables the break key to prevent the program from being listed. DEBUG can also be activated in the midst of a machine language program, as long as memory requirements of the program and DEBUG don't conflict, and the target program does not assume control of the keyboard Device Control Block (DCB) at 4016 hex.

The CHAINING command exercises a series of DOS or BASIC commands, or makes automatic inputs to a BASIC program. The functions are similar to the BOOTSTRAP or COMPROC (from Racet Computers) pro-

grams. One important difference is that BASIC can implement a CMD "CHAIN" instruction which will then activate a predetermined sequence of inputs to BASIC. Think of it as automating the keyboard.

A nice feature of the N80 CHAIN command is that a wasteful five-sector (one gran) file is not necessarily created for each CHAIN file. Append a number of CHAIN command strings into one file, then access only the one that is needed.

The documentation provides a wealth of technical information for making use of N80's internal instruction code. As an example, a DOS CALL machine language routine is provided which allows the incorporation of DOS commands into your programs. Want to use RSM2D to LOAD a file into RAM? You can do it with a dozen bytes of code. How about creating your own SYS-20/SYS file? The documentation explains how. Apparat's no secrets marketing approach is genuinely refreshing.

Disk BASIC, like N80's DOS, is a complete rewrite. BASIC still works as it always did, and there appear to be no BASIC program incompatibilities. Significantly, Disk BASIC has been upgraded with a number of fascinating enhancements.

In addition to being able to RENUMBER a BASIC file, it is now possible to move program lines around within the program. REF (variable and line number cross referencing), improved scrolling, and CMD, as implemented in NEWDOS 2.1, are still available.

In BASIC run-only mode, the BREAK and CLEAR keys are disabled and BASIC will not accept direct statements from the operator. In business applications, this keeps the computer operator from gaining access to unauthorized files or from manipulating the program itself. Apparat thoughtfully made it possible for a BASIC menu program to LOAD or RUN another BASIC program. In other words, it is possible for a BASIC program to call up another program or data file with imbedded commands, but the computer operator cannot do this directly from the keyboard. When turned on, the computer boots up and goes directly to the selected program. The operator has no control other than to operate the program as intended by the boss. Of course DEBUG and MINI-DOS can also be locked out to further frustrate the operator.

A number of wonderful new BASIC disk Input/Output (I/O) enhancements are implemented. Briefly, disk record lengths can be up to 4096 bytes long instead of the old 256 byte maximum. Disk files can be created and accessed in a variety of ways, allowing manipulation of file data in almost any conceivable format, from a single byte to a 4096 byte record, using fixed length files or variable length files. These new disk I/O op-

tions are available via five new BASIC file types which are classified in two major groupings: fixed item files and marked item files.

But the reader is cautioned: Apparat introduces new and esoteric terminology which makes things difficult for the novice. To make it easier, N80 includes a sample program which is accompanied by a tutorial chapter in the documentation, to help the new user along. This beginner's approach, plus an alphabetized dictionary, eases the operator gradually and painlessly into a very powerful set of disk I/O functions.

The operator is walked through the procedures, step by step, for creating and using the new BASIC files. Analogies are made to the traditional sequential and random file operations. With patience and practice, a whole new world of disk I/O manipulation becomes possible.

Your old BASIC files are compatible with N80, and it is still possible to create the "standard" sequential and random files with it.

Areas of Incompatibility

There is no way in the world to maintain total compatibility with existing software, especially when machine language programs directly access non-standard subroutines within the guts of the DOS software itself.

Apparat acknowledges the few, minor incompatibilities in N80, and they provide the necessary zaps or guidance, where applicable, to compensate for them. If and when new problems arise, I feel certain that fixes will become available. It appears at the present time that N80's incompatibilities are trivial.

The following is a brief description of real or potential incompatibilities, as listed in the N80 documentation.

- User routines which are driven by the 25ms TRSDOS or NEWDOS 2.1 interrupt must be modified to work with N80. The N80 documentation explains the patches necessary to correct potential problems. To my knowledge, the only commercial programs that might experience interrupt problems are spoolers and despoolers.

- There is a compatibility problem with ST80III and with the Microsoft FORTRAN package, including the MACRO-80 assembler, but Apparat provides the necessary zaps to make these programs compatible with N80.

- Enabling or disabling the break key was formerly accomplished by changing the address at 4313 hex. The new address to accomplish this is 4369 hex. The procedure is explained in the N80 documentation.

- The same NEWDOS 2.1 incompatibility involving NEXT and EOF in the FCB (file

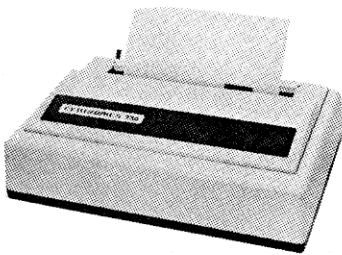
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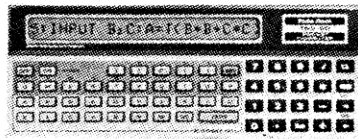
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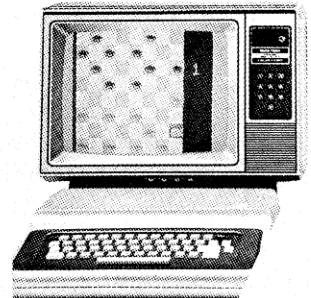
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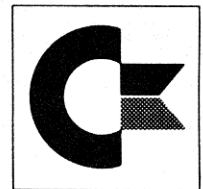


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| Compare disk sectors | Kill files by category (CMD/BAS/TXT/ECT) | Read protect directory track |
| Copy disk sectors | Change name, date, password, auto command | Recover killed files |
| Verify disk sectors | Change file parameters | Complete directory check |
| Zero disk sectors | Remove passwords from all files | Move memory |
| String search (ASCII or NUMBERS) | Format disks (1 to 96 track) | Exchange memory |
| Sector search | Format without erasing existing data | Compare memory |
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"My zaps are necessary to provide access for MINIDOS and DEBUG to the keyboard. Without them, your system will hang."

control block) continues with N80. This has typically been an inconsequential inconvenience for most users.

Scriptit owners have no doubt learned by now that its disk I/O works properly only with TRSDOS. Apparat provides the necessary zaps to make Scriptit work with N80, and with NEWDOS 2.1, also.

These minor incompatibilities will not concern the average user unless one of the spoolers marketed by other distributors is involved. Machine language pros should have no difficulty coping. Again, the N80 documentation lists the old and new interrupt addresses to aid machine language hackers in making repairs.

All popular DOS routines are still accessible with the standard DOS address calls. This applies to BASIC functions as well. The traditional DOS call addresses, plus some new ones, are conveniently listed in the N80 documentation.

Apparat has done an exceptional job of maintaining compatibility among DOS systems. This is especially notable since N80 is a complete rewrite. Not only has Apparat given us the best available DOS system for the TRS-80 (NEWDOS 2.1, and now NEWDOS-80), they have managed to do so with a minimum of inconvenience to the user.

I found two other problems: The Electric Pencil and the Misosys Editor Assembler will not properly read a disk directory. The fixes for both of these programs are provided in Table 1.

The zaps to make N80 function at faster clock speeds are provided in Table 1 for TRS-80s with a CPU clock speedup board installed. If your TRS-80 is modified for the 2.66 MHz CPU clock, first try N80 without; they may not be required.

Those who are running at a 100 percent CPU clock speedup (3.54 MHz) will no doubt have to install my zaps. I am running at 4.0 MHz and N80 requires my zaps to function at this clock speed. You should experience no problems running N80 at either the normal 1.77 MHz or any souped up CPU clock speed, from 2.66 to 4.0 MHz, with the zaps.

Some Hints about MINI-DOS

For MINIDOS to function, the current program (that which is up and running) must allow for enabled interrupts and must not take away the keyboard device control block (DCB) at memory location 4016 hex.

For example, Pencil changes the keyboard DCB, although it does not make use of the DCB after the change; it uses its own keyboard scan routine. The fix is a simple one; I have experienced no problems as a result. The zaps are listed in Table 1.

By teaching Pencil to leave the keyboard DCB alone, it's possible to use MINI-DOS and DEBUG (call it by pressing '123') with-

out crashing Pencil or its text.

If DEBUG is called with Pencil, 5C6F hex is a good re-entry address. Just enter 'G 5C6F' from DEBUG. Pencil's text file will not be disturbed.

My zaps are necessary to provide access for MINIDOS and DEBUG to the keyboard. Without them, your system will hang.

Watch out for the block move routines (the LDIR or LDDR instructions) which move programs or subroutines around in RAM. These routines, including those those created by Apparat's LMOFFSET, normally disable interrupts with the DI machine language code as the first instruction. Unless the program to be run reactivates interrupts, MINI-DOS or DEBUG will not function after this.

The solution is to patch each block move routine as necessary with an enable interrupt command (hex code FB) before the jump to the program's execution address. Here is what it should look like.

```

DI          ;disable interrupts
LD HL,ssss ;source address
LD DE,dddd ;destination address
LD BC,bbbb ;byte count
LDIR        ;move it
New → EI    ;enable interrupts (added)
JP eeee     ;JP to execution address
  
```

With the EI properly inserted, interrupts are re-enabled and (if the program does not permanently disable them again, as RSM2D and others do), MINI-DOS will function normally.

If you have not patched Scriptit with one of these block move routines only one zap is required to re-enable its interrupts. The zap is provided in N80's documentation.

Let me part with one last suggestion. If you have an original NEWDOS 2.1 and are eligible for Apparat's N80 upgrade special deal (submit your registration number and pay the cost differential of \$50), and if you are also considering buying one of the commercially available spoolers, pay the \$50 for the NEWDOS-80 upgrade. You get a spooler for free with NEWDOS-80 and it is probably better than most of those currently available. ■

NOTE: After this article was submitted for publication, Apparat released a number of Zaps to fix newfound bugs in NEWDOS 80. One large set of Zaps in particular—ZAP 031—overwrites most of my fast clock zaps.

Table of NEWDOS 80 Zaps

The relative file's sector is given in hex, then the relative byte in hex. The format is: 05/06 = relative sector five, relative byte 60. I emphasize the use of hex because the new SUPERZAP/CMD will accept decimal inputs as well as hex.

1. To make Pencil read a directory properly:

```

05/06  Change: 58 23 22
          To: 58 00 22
  
```

2. To make the Misosys EDTASM read a directory properly:

```

08/39  Change: 5D 13 ED
          To: 5D 00 ED
  
```

3. To make Pencil accept a MINI-DOS request:

```

00/61  Change: 54 22 16 40 21
          To: 54 00 00 00 21
  
```

Also, verify that 00/C5 reads C1 FB C9. 01/57 should read C9 FB 21. (Some users zeroed out the FB, which is an enable interrupt code, because of old TRSDOS 2.1 problems).

4. Fast Clock Zaps (Caution: these zaps use DOS RAM areas that appear to be unused, but may turn out to be used by some routine I haven't yet found. If you develop a problem I would appreciate hearing about it):

```

SYS0/SYS: 03/54  Change: C5 0A 08 F5 E5 E1 E5 E1 F3
          To: C5 C3 F5 4C E3 E3 E3 E3 F3
  
```

(The E3s may already be in your SYS0/SYS. If so, it will still be necessary to put in the C3 F5 4C).

Table continues

"... the N80 documentation lists the old and new interrupt addresses to aid machine language hackers in making repairs."

In addition, Percom has recently released a double density board for the TRS-80 Model I disk system, and Circle J Software quickly thereafter released Double-Zap II to configure NEW-DOS-80 for double density operation. These deserve additional comment so as to avoid problems with those of you who may become confused by all of the DOS Zaps being tossed about.

Here are your options:

1. No Double-Density Applications:

a. Completely omit Apparat's ZAP 031 if you are not using the Omikron Mapper, because it slows down your computer noticeably. Omitting ZAP 031 retains the original DOS operating speed and does not affect system reliability or operation. In this way you can still apply my fast clock zaps and be none the worse off.

b. If you are intent on installing ZAP 031, you can still run at fast clock CPU speeds because Apparat wrote ZAP 031 so that it will function in fast clock systems, with one exception. With ZAP 031 installed, omit all of my fast clock zaps except for the one in SYS0/SYS:

04/0A, change: 11 00 24 1B
to: 11 00 52 1B

Some users find that values smaller than the 52 used herein work better in their systems. You might want to experiment with different values.

2. Double-Density Applications:

Double-Zap II (Circle J Software) absolutely requires installation of Apparat's ZAP 031 for double-density operation. Again, there is no problem with fast clock operations if the same change to SYS0/SYS (at 04/0A) is installed.

Hopefully these comments will prevent some inevitable confusion. Good luck.

SYS0/SYS: 04/7E Change: 01 00 80 DC

To: 01 00 00 DC

SYS0/SYS: 04/89 Verify: C9 E3 E3 E3 E3 3A
(The E3s here were already in place in my copy).

SYS0/SYS: 04/A0 Change: 11 00 24 1B
To: 11 00 52 1B

SYS0/SYS: 0A/10 Change: 00 00 00 00 00 00
00 00 00 00 00 A5
(eleven bytes of zeros)
To: E3 E3 E3 E3 0A 08
F5 C3 59 46 00 A5

SYS6/SYS: 04/C7 Change: 01 00 80
To: 01 00 00

SYS6/SYS: CC/20 Verify: E3 E3 E3 E3 0A
(The E3s were already on my copy).

0C/27: Change: 5E CB 4E C2 37 5E CB 4E 20 3A CB 4E 20
36 CB 4E 20 32 CB 4E 20 2E CB 4E 20 2A
CB 4E 20 26 D9 C9 CB 4E C2 3F 5E CB 4E
20 23 CB 4E 20 1F CB 4E 20 1B CB 4E 20
17 CB 4E 20 13 CB 4E 20 0F D9 (Stop)

To: 5E C5 06 12 CB 4E 20 05 10 FA C1 D9 C9
C1 C3 37 5E 00 00 00 00 00 00 00 00
00 00 00 00 00 00 C5 06 12 CB 4E 20 05
10 FA C1 D9 C9 C1 C3 3F 5E 00 00 00 00
00 00 00 00 00 00 00 00 D9 (Stop)

0C/9F Change: 0A CB 4E C2 48 5E CB 4E 20 D3 CB 4E 20
CF CB 4E 20 CB CB 4E 20 C7 CB 4E 20 C3
CB 4E 20 BF CB 4E 20 BB 08 (Stop)

To: 0A C5 06 16 CB 4E 20 06 10 FA C1 C3 8D
5E C1 C3 48 5E 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 08 (Stop)

5. To make the break key functional for the 'JKL' screen print option (Caution: again, these zaps use DOS RAM areas that appear to be unused, but may turn out to be used by some routine I haven't found yet.)

SYS0/SYS: 00/B9: Change: All zeros (Note—there is a 01 at 00/B1. Sector/BYTE 00/B9 corresponds to RAM memory location 43A6).

To: F5 E5 3A 7F 38 FE 04 28 08 E1
F1 CB 74 23 C3 B2 45 3E 0D CD
3B 00 E1 F1 C3 66 45 00 (Stop)

SYS0/SYS: 02/A9: Change: 7E CB 74 23 20
To: 7E C3 A6 43 20

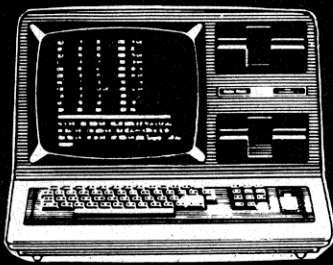
6. Zap to the BASIC/CMD file to implement BASIC's unused NAME command. After setting this zap, entering NAME from BASIC will cause a jump to the address specified in the NAME jump vector. For example, LOAD RSM2D48/CMD into high memory with an appropriate memory size protect, using either the (4049) entry or BASIC's 'MEMORY SIZE?' request. RSM2D's execution address (48K version) is EE94 hex.

Make the zaps to the BASIC/CMD file in the usual way.

BASIC/CMD: 16/72: Change: C3 4A 1E C3
To: C3 94 EE C3

With RSM2D (48K version) in high memory, entering NAME will jump to RSM2D. To get back to BASIC gracefully from RSM2D, enter 'G 0072' (Go to address 72 hex). READY and its prompt will appear and the resident BASIC program will be intact.

This can also be done with NEWDOS 2.1 or TRSDOS 2.3. Just fine the C3 1E 4A (for the NAME function) in the BASIC/CMD file and change it in the same way.



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| 6 BREAKEVN | Breakeven analysis |
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| 8 DEPRSY | Sum of the digits depreciation |
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| 11 TAXDEP | Cash flow vs. depreciation tables |
| 12 CHECK2 | Prints NEBS checks along with daily register |
| 13 CHECKBK1 | Checkbook maintenance program |
| 14 MORTGAGE/A | Mortgage amortization table |
| 15 MULTMON | Computes time needed for money to double, triple, etc. |
| 16 SALVAGE | Determines salvage value of an investment |
| 17 RRVARIN | Rate of return on investment with variable inflows |
| 18 RRCONST | Rate of return on investment with constant inflows |
| 19 EFFECT | Effective interest rate of a loan |
| 20 FVAL | Future value of an investment (compound interest) |
| 21 PVAL | Present value of a future amount |
| 22 LOANPAY | Amount of payment on a loan |
| 23 REGWITH | Equal withdrawals from investment to leave 0 over |
| 24 SIMPDISK | Simple discount analysis |
| 25 DATEVAL | Equivalent & nonequivalent dated values for oblig. |
| 26 ANNUDEF | Present value of deferred annuities |
| 27 MARKUP | % Markup analysis for items |
| 28 SINKFUND | Sinking fund amortization program |
| 29 BONDVAL | Value of a bond |
| 30 DEplete | Depletion analysis |
| 31 BLACKSH | Black Scholes options analysis |
| 32 STOCVAL1 | Expected return on stock via discounts dividends |
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| 38 OPTWRITE | Option writing computations |
| 39 RTVAL | Value of a right |
| 40 EXPVAL | Expected value analysis |
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| 46 TRANS | Transportation method for linear programming |
| 47 EOQ | Economic order quantity inventory model |
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| 50 CONDPFOT | Conditional profit tables |
| 51 OPTLOSS | Opportunity loss tables |
| 52 FQJQOQ | Fixed quantity economic order quantity model |

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| 68 TIMETR | Time series analysis linear trend |
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| 79 INVOICE | Generate invoice on screen and print on printer |
| 80 INVENT2 | In memory inventory control system |
| 81 TELDIR | Computerized telephone directory |
| 82 TIMJSA | Time use analysis |
| 83 ASSIGN | Use of assignment algorithm for optimal job assign. |
| 84 ACCTREC | In memory accounts receivable system-storage ok |
| 85 TERMSPAY | Compares 3 methods of repayment of loans |
| 86 PAYNET | Computes gross pay required for given net |
| 87 SELLPR | Computes selling price for given after tax amount |
| 88 ARBCOMP | Arbitrage computations |
| 89 DEPRSF | Sinking fund depreciation |
| 90 UPSZONE | Finds UPS zones from zip code |
| 91 ENVELOPE | Types envelope including return address |
| 92 AUTOEXP | Automobile expense analysis |
| 93 INSFILE | Insurance policy file |
| 94 PAYROLL2 | In memory payroll system |
| 95 DILANAL | Dilution analysis |
| 96 LOANAFDD | Loan amount a borrower can afford |
| 97 RENTPRCH | Purchase price for rental property |
| 98 SALELEAS | Sale-leaseback analysis |
| 99 RRCONVBD | Investor's rate of return on convertible bond |
| 100 PORTVAL9 | Stock market portfolio storage-valuation program |

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NAME

| | |
|-------------|--|
| 53 FQEQOWSH | As above but with shortages permitted |
| 54 FQEQQPB | As above but with quantity price breaks |
| 55 QUEUECB | Cost-benefit waiting line analysis |
| 56 NCFANAL | Net cash-flow analysis for simple investment |
| 57 PROFIND | Profitability Index of a project |
| 58 CAP1 | Cap. Asset Pr. Model analysis of project |

DESCRIPTION

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SYSTEMS GROUP

COORDINATED BUSINESS SYSTEMS

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FACTS ABOUT THE S.B.S.G. BUSINESS PACKAGES

1. **S.B.S.G.** is a sophisticated Business Software System designed for the serious businessman.
2. Each of the **S.B.S.G. Business Modules** may be purchased separately...or you may purchase the entire coordinated business system.
3. Modules purchased separately do not coordinate with the General Ledger (although for the standard **S.B.S.G.** fee, the user may upgrade his individual modules for the coordinated system).
4. Foolproof, Step-By-Step procedures are supplied, planned and documented for the **First-Time Computer User**. All programs are self-explanatory, telling the user what is required at every step.
5. Programs are written in **BASIC** and the source code listing is supplied for those users who decide to modify the original system.
6. A complete users manual is supplied with each module.
7. Demo Data diskettes are supplied with sample data.
8. **S.B.S.G.** has an In-House staff that can answer questions and problems related to the proper use of the **S.B.S.G. Business System** (on the telephone or through the mail).
9. First-Time Computer Owners Note-Instructions are provided for entering state payroll withholding tables. There is an additional charge if you prefer to have **S.B.S.G. Programmers** insert the correct data.
10. Minimum system requirement is 2-drives to run any single module.
11. Minimum system requirement is 3-drives to run the coordinated business system (AR-AP-GL) or (AR-AP-GL with PAYROLL).
12. Minimum system requirement is 4-drives to run the extended coordinated system (AR-AP-GL-PR and INVENTORY/INVOICING).
13. The **A. OSBORNE & ASSOCIATES** business manuals are provided **FREE** with each order (they may be purchased separately at \$20 per manual).
14. The **INVENTORY** and **INVOICING** modules are original programs written by **S.B.S.G.**
15. Each module can be purchased as independent modules to run on a 2 or more drive system except **INVOICING**.
16. Memory requirement is 48K for the **MODEL-I** and 64K for the **MODEL-II**.
17. All **S.B.S.G. BUSINESS SYSTEMS** may be upgraded up to 4-disk drives. No data is ever lost during an upgrade. There is a standard **S.B.S.G.** charge for all upgrades.

ACCOUNTS PAYABLE

The accounts payable system receives data concerning purchases from suppliers and produces checks in payment of outstanding invoices. In addition, it produces cash management reports. This system aids in tight financial control over all cash disbursements of the business. Several reports are available and supply information needed for the analysis of payments, expenses, purchases and cash requirements. All A/P data feeds General Ledger so that data is entered into the system just once. These programs were developed 5 years ago for the Wang micro-computer and have been tested in many environments since then. The package has been converted to the TRS-80™ and is now well documented, on-line, interactive micro-computer system with the capabilities of (or exceeding many larger systems).

CAPABILITIES:

- ★ menu driven; easy to use; full screen prompting and cursor control
- ★ invoice oriented; everything revolves around the invoice; handles new invoice or credit memo or debit memo
- ★ invoice information recorded; invoice #, description, buyer, check register #, invoice date, age date, amount of invoice, discount (in %), freight, tax (\$), total payable
- ★ transaction print and file maintenance procedures insure accuracy
- ★ flexible check calculation procedure; allows checks to be calculated for a set of vendors-or-for specific vendors
- ★ program prints your checks; contiguous computer checks with your company letterhead can be purchased from SBSG
- ★ reports include (samples on back):
 - open item listing/closed item listing - both detail and summary
 - debit memo listing/credit memo listing
 - aging
 - check register report (to give an audit trail of checks printed)
 - vendor listing and vendor activity (activity of the whole year)
- ★ fully linked to **GENERAL LEDGER**; each invoice can be distributed to as many as five (5) different GL accounts; system automatically posts to cash and A/P accounts

ACCOUNTS RECEIVABLE

The objective of a computerized A/R system is to prepare accurate and timely monthly statements to credit customers. Management can generate information required to control the amount of credit extended and the collection of money owed in order to maximize profitable credit sales while minimizing losses from bad debts. The programs composing this system were developed 5 years ago, especially for small businesses using the Wang Microcomputer. They have been tested in many environments since then. Each module can be used stand alone or can feed General Ledger for a fully integrated system.

CAPABILITIES:

- ★ menu driven; easy to use; full screen prompting and cursor control
- ★ invoice oriented; invoices can be entered before ready for billing, when ready for billing, after billing or after paid
- ★ allows entry of new invoice, credit memo, debit memo, or change/delete invoice
- ★ allows for progress payment
- ★ transaction information includes:
 - type of A/R transaction
 - customer P.O. #
 - description of P.O.
 - shipping/transportation charges
 - tax charges
 - payment
 - progress payment information
 - transaction print & file maintenance procedures insure accuracy
- ★ customer statements printed; computer statements with your company letterhead can be purchased from SBSG
- ★ reports include: (samples on back)
 - listing of invoices not yet billed
 - open items (unpaid invoices)
 - closed items (paid invoices)
 - aging
- ★ fully linked to General Ledger; will post to applicable accounts; debit A/R, credits account you specify

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PAYROLL

Payroll involves many complex calculations and the production of reports and documents, many of which are required by government agencies. It is an ideal candidate for the computer. With this Payroll system in-house, you can promptly and accurately pay your employees and generate accurate documents/reports to management, employees, and appropriate government agencies concerning earnings, taxes, and other deductions. The package has been converted to the TRS-80™ and is now a well documented, on-line, interactive, micro-computer system with the capabilities of (or exceeding) many larger systems.

CAPABILITIES:

- ★ performs all necessary payroll tasks including:
 - file maintenance, pay data entry and verification
 - computation of pay and deduction amounts
 - printing of reports and checks
- ★ can handle salaried and hourly employees
- ★ employees can receive:
 - hourly or salary wage
 - vacation pay
 - holiday pay
 - piecework pay
 - overtime pay
- ★ employees can be paid using any combination of pay types (except, hourly cannot receive salary and salary cannot receive hourly)
- ★ special non-taxable or taxable lump sums can be paid regularly or one time (bonus, reimbursements, etc)
- ★ health and welfare deductions can be automatically calculated for each employee
- ★ earnings-to-date are accumulated and added to permanent records; taxes are computed and deducted: US income tax, Social Security tax, state income tax, other deductions (regular or one time)
- ★ paychecks are printed; computer checks with your company letterhead can be purchased from SBSG
- ★ calculations are accumulated for; employee pay history, 941A report, W-2 report, insurance report, absentee report
- ★ fully linked to General Ledger. Each employee's payroll information can be distributed to as many as (12) twelve different GL accounts; system automatically posts to cash account

INVENTORY CONTROL/INVOICING

- ★ **ISAM** (Indexed Sequential Access Method) eliminates the necessity for time consuming sort.
- ★ Pre-Allocated Files for IMMEDIATE update and inquiry capabilities.
- ★ Fast Disk storage and retrieval.
- ★ Inventory Master Record includes...class...SKU...Division...Retail...Cost...Beginning Balance...Period Sale Units...Period Receipts...On Order...On Hand...Minimum Reorder Point...Recommended Reorder Amount...Vendor Number...Period Sale Dollars...YTD Sale Units...YTD Sale Dollars.
- ★ Calculated and Displayed Formulas include...Gross Margin (\$)...Gross Margin (%)...Gross Margin ROI (%)...Average Inventory Retail (\$)...Average Inventory Cost (\$)...Turn-Over (%).
- ★ Reports Generated include...Master File Listing...Class Description Listing...Transaction Audit Trail...Minimum Reorder Point by Vendor...Retail Price List...Retail & Cost Price List...Period Sales Report...Year to Date Sales Report...Stock Status (Screen or printer output)...Commission Report (for salesmen and buyers).
- ★ Transaction Types include...Sales...Vendor Receipts...Vendor Orders...Customer Returns...Vendor Returns...Transfer Stock.

GENERAL LEDGER

The General Ledger accounting system consolidates financial data from other accounting subsystems (A/R, A/P, Payroll, direct posting) in an accurate and timely manner. Major reports include the Income Statement and Balance Sheet and a "special" report designed by management. The beauty of this General Ledger system is that it is completely user formatted. You "customize" the account numbers, descriptions, and report formats to suit particular business requirements. These programs were developed 5 years ago for the Wang micro-computer and have been tested in many environments since then. The package has been converted to the TRS-80™ and is now a well documented, on-line, interactive micro-computer system with the capabilities of (or exceeding) many larger systems.

CAPABILITIES:

- ★ more than 200 chart of accounts can be handled
- ★ account number structure is user defined and controlled
- ★ more than 1,750 transactions may be entered via:
 - direct posting; done by hand; validated against the account file before acceptance
 - external posting; generated by A/R, A/P, Payroll or any other user source
- ★ data is maintained and reported by:
 - month
 - quarter
 - year
 - previous three quarters
- ★ reports (samples on back) include:
 - trial balances
 - income statement
 - balance sheet
 - special accounts reports and more.....
- ★ user formats reports with the following designated as you wish:
 - titles
 - headings
 - account numbers
 - descriptions
 - subtotals
 - totals
 - skip lines
 - skip pages
- ★ up to eight levels of totals - fully user designated
- ★ menu driven; easy to use; full screen prompting and cursor control

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|--|------------------|-------------------|--------------------|
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| ACCOUNTS PAYABLE | \$125 | \$225 | \$199.95 |
| GENERAL LEDGER | \$125 | \$225 | \$199.95 |
| PAYROLL | \$125 | \$225 | \$199.95 |
| INVENTORY | \$175 | \$275 | \$199.95 |
| INVOICING | \$150 | \$250 | \$199.95 |
| COORDINATED INVENTORY/INVOICING ACCOUNTS RECEIVABLE | \$449 | \$749 | \$599.95 |
| COORDINATED AR-AP-GL | \$375 | \$675 | \$599.95 |
| COORDINATED AR-AP-GL with PAYROLL | \$495 | \$899 | \$799.95 |
| EXTENDED COORDINATED AR-AP-GL INVOICING/INVENTORY with PAYROLL | \$799 | \$1299 | \$1199.95 |

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MICROSOFT BASIC COMPILER

With TRS-80™ BASIC Compiler, your Level II programs will run at record speeds! Compiled programs execute an average of 3-10 times faster than programs run under Level II. Make extensive use of integer operations, and get speeds 20-30 times faster than the interpreter.

Best of all, BASIC Compiler does it with BASIC, the language you already know. By compiling the same source code that your current BASIC interprets, BASIC Compiler adds speed with a minimum of effort.

And you get more BASIC features to program with, since features of Microsoft's Version 5.0 BASIC interpreter are included in the package. Features like the WHILE...WEND statement, long variable names, variable length records, and the CALL statement make programming easier. An exclusive BASIC Compiler feature lets you call FORTRAN and machine language subroutines much more easily than in Level II.

Simply type in and debug your program as usual, using the BASIC interpreter. Then enter a command line telling the computer what to compile and what options to use.

Voila! Highly optimized, Z-80 machine code that your computer executes in a flash! Run it now or save it for later. Your compiled program can be saved on disk for direct execution every time.

Want to market your programs? Compiled versions are ideal for distribution. You distribute only the object code, not the source, so your genius stays fully protected.

BASIC Compiler runs on your TRS-80™ Model I with 48K and disk drive. The package includes BASIC Compiler, linking loader and BASIC library with complete documentation **\$195.00**

1980 INCOME TAX PAC

Completely Revised - Latest Tax Tables - Fully Tested - Complete Manual and Documentation. The new version of the Income Tax Pacs are full of error catching codes making it impossible to make an error. Follow the simple Step By Step procedure that makes tax preparation simple.

INCOME TAX PAC A **(\$19.95...Cassette)**

For Level II 16K Cassette Only

Does Form 1040 and 1040A

- Schedule A itemized deductions
- Schedule B interest and dividends
- Output to video display
- Schedule TC tax computation

INCOME TAX PAC B **\$49.95...Cassette or Diskette)**

For Level II 16K with or without printer...cassette or disk has all features of Income Tax Pac A **Plus** works with or without line printer.

- Formats Form 1040 and 1040A for standard tax forms
- Schedule C income from a personally owned business
- Form 2106 employee business expense

PROFESSIONAL INCOME TAX PAC C **\$99.95...Diskette**

For Level II 32K with disk and printer (optional)

Has all features of Income Tax Pac B **Plus** automatic memory storage for income tax preparers.

- 22 additional schedules and forms
- Formats forms for individual or tractor feed printing

MOD II CPA VERSION **\$199.95**

GUARANTEED PROFIT 91% WINS PLACES 32% AVERAGE PROFIT AT ALL TRACKS-1978 SHOWS

THE HORSE SELECTOR II (FLATS) (By Dr. Hal Davis) **\$50.00**

New simplified version of the original Horse Selector. The first Horse Selection System to actually calculate the estimated odds of each horse.

HIGHER PROFITS (OVER 100%) POSSIBLE THROUGH SELECTIVE BETTING ON:

- Rates each horse in 10 seconds.
- Easy to follow rules.
- Can be used with any Apple II Computer.
- 100% money back guarantee (returned for any reason).
- Uses 4 factors (speed rating, track variant, distance of the present race, distance of the last race).
- Using the above factors, the Horse Selector calculates the estimated odds. BET on horses whose actual payoff (from the Tote Board or Morning Lines) is higher than payoff based on estimated odds.
- Using the above factors, the Horse Selector calculates the estimated odds. BET on any selected horse with an estimated payoff (based on Tote Board or Morning Lines) higher than calculated payoff (based on Horse Selector II).
- Source listing for the TRS-80™, TI-59, HP-67, HP-41, Apple and BASIC Computers.
- No computer or calculator necessary (although a calculator would be helpful for the simple division used to calculate estimated odds).

FREE Dutching Tables allows betting on 2 or more horses with a guaranteed profit.

NEWDOS/80

A New enhanced NEWDOS for TRS-80™ Model I for the 1980's

Apparat Inc., announces the most powerful Disk Operating System for the TRS-80™. It has been designed for the sophisticated user and professional programmer who demands the ultimate in disk operating systems.

NEWDOS/80 is not meant to replace the present version of NEWDOS 2.1 which satisfies most users, but is a carefully planned upward enhancement, which significantly extends NEWDOS 2.1's capabilities. This new member to the Apparat NEWDOS family is upward compatible with present NEWDOS 2.1 and is supplied on Diskette, complete with enhanced NEWDOS + utility programs and documentation. Some of the NEWDOS/80 features are:

- New BASIC commands that supports with variable record lengths up to 4095 Bytes long.
- New BASIC commands that supports with variable record lengths up to 4095 Bytes long.
- Mix or match disk drives. Supports any track count from 18 to 80. Use 35, 40 or 77 track 5" mini disk drives or 8" disk drives, or any combination.
- A security boot-up for BASIC or machine code application programs. User never sees "DOSREADY" or "READY" and is unable to "BREAK", clear screen, or issue any direct BASIC statement including "LIST."
- New editing commands that allow program lines to be deleted from one location and moved to another or to allow the duplication of a program line with the deletion of the original.
- Enhanced and improved RENUMBER that allows relocation of subroutines.
- Powerful program chaining.
- Device hanging for routing to display and printer simultaneously.
- CDE function; simultaneous striking of the C, D and E keys will allow user to enter a mini-DOS to perform some DOS commands without disturbing the resident program.
- Upward compatible with NEWDOS 2.1 and TRSDOS 2.3.
- Includes Superzap 3.0 and all Apparat 2.1 utilities.

..... **\$149.00**

STOCK MARKET MONITOR

Galactic Software Ltd.

CASSETTE VERSION **\$89.00**

DISK VERSION **\$99.00**

1. The system is designed for the active "trader" not the "long term" investor, as the system is "technically" oriented.
2. For the TRS-80™ Model I, Level II, 16K or more. Available in both disk and tape versions.
3. Tracks user selected issues, in a technical system that reflects the issue's performance against the overall market.
4. Set up data is input by the user from the Standard and Poors stock guide or Value Line.
5. Daily issue data, "high", "low", "close" and "volume" are input from any newspaper containing this information.
6. Daily overall market, "volume" and "closing Dow" are also provided from a newspaper.
7. Volume and price changes of an issue, as they compare to volume and price changes of the overall market, are the basis of this system's analysis of the given issue.
8. Comparisons of the issue against itself are also done. This may allow the user to spot "unusual" activity on this issue.
9. Clear indications are given as to whether the issue is "out performing", "under performing" or "performing" with the market.
10. Complete video and printed output is provided.
11. This program is intended to be a guide to indications, and is not to be used as a sole recommendation to buy, sell or hold an issue. These decisions are the responsibility of the user and his brokerage.

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- (1) **GENERAL LEDGER, ACCOUNTS RECEIVABLE, ACCOUNTS PAYABLE, PAYROLL, INVENTORY CONTROL AND INVOICING** (Small Business Group).....an extensive business system for the serious user.....can be used one module at a time or as a coordinated system.....
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- (4) **INFORMATION SYSTEM** (The Bottom Shelf).....An in-memory information system for small mailing lists, inventories (i.e. books, articles, records, program reference files).....Can be used for anything that you would use rolodex or index card files.....Up to ten user define fields.....Programmable printouts for rolodex cards, mailing labels, etc.....Will identify all records that contain a group of characters you've entered even if that group is in the middle of a line.....Sorts data base by any field
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- (5) **DATA MANAGER II** (The Bottom Shelf).....RANDOM ACCESS Disk based DATA MANAGEMENT SYSTEM (Similar to INFORMATION SYSTEM above.....but RANDOM ACCESS STORAGE expands the amount of storage space available).....Used to replace index cards for medium sized mail lists, inventories, personnel records, sales prospects, etc.....Uses up to four disk drives on line.....Up to twenty user defined fields, programmable printouts for rolodex cards, etc.....will identify all records that contain a group of characters you've entered even if that group is in the middle of a line.....maintain up to 5 changeable presorted "key" files.....variable length random records (the smaller the record you define, the more records you can store)
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- (6) **BUSINESS MAIL SYSTEM** (The Bottom Shelf).....Handles large mailing lists (up to 150,000 names).....supports 3 or 4 line addresses.....files automatically in zip code order, alphabetical within zip code.....formats for 1 to 4 across mailing labels.....supports quick disk location of single or multiple names.....meets all industry and postal standards.....numeric code fields included for printing selected records
\$125.00*
- (7) **ANALYSIS PAD** (The Bottom Shelf).....A Columnar Calculator for financial analysis, line item budgeting, cost analysis, sales analysis and almost any financial function (and many statistical functions).....create matrixes of 29 x 39.....make all entries at one time either by row or column.....add, delete, move or switch columns and rows.....edit any data from full screen display.....add, subtract, multiply and divide one column by another and put results in designated column (up to six calculations can be made and placed in designated column).....define columns as constants.....save calculations and formulas on disk.....results can be printed in a variety of report formats
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- (12) **HORSE SELECTOR II** (Dr. Hal Davis).....New simplified version of the original Horse Selector (for flats).....The first Horse Selection System to actually calculate the estimated odds for each horse.....easy to follow rules.....uses 4 factors (speed rating, track variant, distance of the present race, distance of the last race).....calculated estimated odds.....FREE DUTCHING TABLES allows betting on 2 or more horses with a guaranteed profit
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- (13) **MON-3 and MON-4** (Howe Software).....Powerful utility programs enabling you to interact directly with your TRS-80 in MACHINE LANGUAGE.....The monitor comes with complete 40-page instruction manual making it useful for both the beginner and advanced programmer.....simple commands make it easy to use.....functions include DISPLAY, DISASSEMBLE, MOVE and COMPARE, SEARCH, MODIFY, RELOCATE, PRINT, READ and WRITE, UNLOAD, SAVE and READ, INPUT and OUTPUT, SEND and RECEIVE.....MON-3 **\$39.95** (for cassette).....MON-4 **\$49.95** (for disk).

- (14) **SMART TERMINAL** (Howe Software).....enables your TRS-80 to be used as a remote terminal to a time sharing computer system
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\$69.95
- (17) **HOME BUDGET** (Howe Software).....combines the maintenance of your checkbook with analysis of your income, expenses and monthly bills. Handles data including bills, income, deposits, checks and debits to your checking account, and cash expenses. Computes checkbook balance, list of unpaid bills, monthly and year-to-date summaries of income and expenses showing income tax deductions.....All output printed on video display or line printer.....comes with complete instructions manual
\$49.95*
- (18) **SMALL BUSINESS ACCOUNTING** (Howe Software).....Based on the DOME BOOKKEEPING SYSTEM.....keeps track of all income, expenditures and payroll for a small business of up to 16 employees.....income and expenditures can be entered on a daily, weekly or monthly basis.....computes monthly and year to date totals.....manual contains complete instructions for customization
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- (21) **DOSORT** (Racet Computers).....includes GSF (above).....extends the in memory sort to sorts on multiple disk drives
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See if you get the point of this programming exercise.

The Dot Game

Arthur J. Welcher
360 S. Wetherly Drive
Beverly Hills CA 90211

If you really want to learn how to program, write a game," said my experienced friend when I took delivery of my TRS-80.

I began to visualize knights on horseback, castles with hundreds of rooms, fields of men and artillery, airplanes and rocket ships in the skies, and I could see what my friend was talking about!

I shall not fall into the trap of endless revising, I thought. I shall select a simple game for my first attempt. An old standby, maybe some graphics just to make it interesting. I finally came up with the Dot Game. It hasn't been overdone, in fact, it has been almost forgotten! It has pre-planned moves, and easy graphics; perfect!

Remember the Game?

In case you don't remember, the game of connecting the dots goes like this: Each player takes a turn where he draws a line to

connect two adjacent dots, either vertical or horizontal. If you are able to complete a simple box with your line, you score a point and receive another turn. Whoever has the most boxes when the game board has been completed, with all dots connected, is the winner.

To begin, lay out the game board in lines 5000 to 5170.

First, you must establish the move subroutine in line 2000 to 3040 depending on whether it is a horizontal or vertical move. For a vertical move, go from the top coordinate to the bottom coordinate and from the left coordinate to the right for a horizontal move.

Also, when the letter of the coordinate is entered it must be followed by a comma, and then the number. For example: a legitimate horizontal move, going from left to right, would be B, 3 ENTER to B, 4 ENTER. A legitimate vertical move, going from top to bottom, would be C, 7 ENTER to D, 7 ENTER.

This works, and I settled for it, but you don't have to. You could modify the program to take the coordinates without the comma using a VAL(RIGHT\$(X\$,1) and VAL(LEFT\$(X\$,1) or you could modify it so that it is possible to enter it right to left as well (IF

M>N THEN N1=N:M1=M:M=N1:N=M1).

After each move, we go to the scoring subroutine at lines 5500 to 5520. This subroutine checks to see if the line can complete a box. In the case of a horizontal line, the box above and the box below the move are scanned by using the Point command to see if a line exists for each of the other three sides. For a vertical move, the program uses the same process to determine possible boxes to the left and right of the entered line.

If you have a completed box, a score will tally and you will be returned to line 5179 to make another move. At the end of your moves, the score will register on the board, and it will become the opponent's move.

Originally for Two

I originally wrote this program

for two players, but I decided that if the computer could scan your move, it could also take the move to complete a box. If the computer cannot make a box, it would take a random move. All of this happens in lines 5522 to 7166.

This routine was written to start its scan at coordinate A, 1. The computer takes a few moments to scan the entire board looking for a box to complete. This works well, so I settled for it. But I have used a little logic since then, and decided that the scan need only start one line above, and one row to the left of the last move in order to discover if your move created three sides of a box. If you begin to tire waiting for the computer to make its move, try making this change in the program yourself.

I hope you have as much fun with it as I did. ■

```

5  CLS
6  Z=0
7  T=0:O=0:S=1
10 PRINT"THIS IS THE GAME OF CONNECTING DOTS"
20 INPUT"ENTER PLAYER 1 HERE";A$
25 INPUT"IF YOU WANT TO PLAY THE COMPUTER ENTER 1 ELSE
   2";A
27 ON A GOTO32,30
30 INPUT"ENTER PLAYER 2 HERE";B$
31 GOTO1000
32 Z=1:B$="COMPUTER"

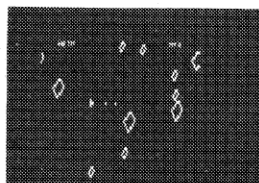
```

Program continues

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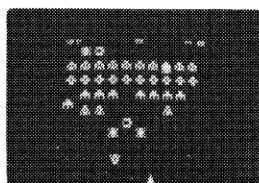
TRS-80 HOME ARCADE

SUPER NOVA[©]



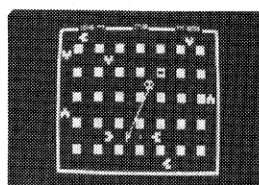
If you and your TRS-80 have longed for a fast-paced arcade-type game that is truly a challenge, then **SUPER NOVA** is what you've been waiting for. In this two player machine-language game, large asteroids float ominously around the screen. Suddenly your ship appears and you must destroy the asteroids before they destroy you! (But watch out because big asteroids break apart into little ones.) The controls that your ship will respond to are thrust, rotate, hyperspace, and fire. All right! You've done it! You've cleared away all the asteroids! But what is that saucer with the laser doing? Quick! You must destroy him fast because that guy's accurate!

GALAXY INVASION[©]



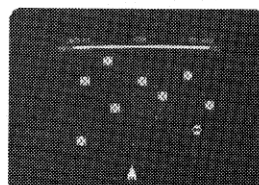
The sound of the klaxon is calling you! Cruel and crafty invaders have been spotted in battle formation warping toward Earth at an incredible speed. Suddenly, your ship materializes just below the huge flock of invaders. Quickly and skillfully you shift right and left as you carefully fire your lasers at them. But watch out! A few are breaking out of the convoy and flying straight at you! As the whine of their engines gets louder, you place your finger on the fire button knowing all too well that this shot must connect—or your mission will be permanently over! With sound effects!

ATTACK FORCE[©]



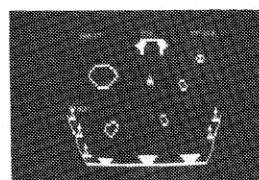
Your TRS-80 screen has been transformed into a maze-like playfield for this game. As your ship appears on the bottom of the screen, eight alien ramships appear on the top. All of them are traveling at flank speed directly at you! Quickly and boldly you move toward them and fire missiles to destroy them. But the more aliens you destroy, the faster the remaining ones become. If you get too good you must endure the wrath of the keeper of the mazefield: the menacing "Flagship". You must destroy him fast because, as you will find out, that guy's accurate! With sound effects!

COSMIC FIGHTER[©]

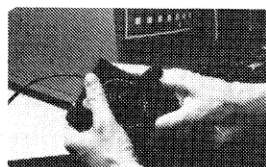


With thousands of stars whizzing by you, your **SPACE DESTROYER** ship comes out of hyperspace directly under a convoy of aliens. Almost effortlessly, you skillfully destroy every last one. But before you can congratulate yourself, another set appears. These seem to be slightly more intelligent than the first set. Quickly you eliminate all of them, too. But your fuel supply is rapidly diminishing. You must still destroy two more sets before you can dock with your space station. All right! The space station is now on your scanners! Oh no! Intruders have overtaken the station! You must skillfully fire your neutron lasers to eliminate the intruders from the station before your engines run out of fuel and explode! With sound!

METEOR MISSION II[©]



As you look down on your space viewer you can see the stranded astronauts that are crying out for you to rescue them. But first you must maneuver your shuttle down through the asteroids & meteors before you can reach them. Great! You've got one! But now can you get back to the space station to save your fellow shipmate or will you crash and kill both of you? You can fire your lasers to destroy the asteroids, but watch out, because there could be an alien **FLAGSHIP** lurking behind! Includes sound effects!



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```

40 CLS
1000 REM.
1010 A=10:B=13:C=16:D=19:E=22:F=25:G=28:H=31:I=34:J=37
1020 K=22+((N-1)*8)
1025 GOTO5000
1070 REM IF M-N>1 THEN5180
1080 REM IF P-L>3 THEN5180
1090 IF (M>N)AND (P=L) THEN2000
1100 IF (M=N)AND (P>L) THEN3000
2000 K=22+(N-1)*8
2005 FOR X=K TO K+8
2010 SET(X,L)
2020 NEXTX
2030 GOSUB5185
2040 GOTO5500
3000 FOR Y=L TO L+3
3010 SET(22+((N-1)*8),Y)
3020 NEXTY
3030 GOSUB5185
3040 GOTO5515
5000 REM.GAME BOARD
5001 CLS
5060
5070 FOR W = 1 TO 10
5080 PRINT@133 +4*W,W;
5090 NEXTW
5110 PRINT@196,"A":PRINT@260,"B":PRINT@324,"C":PRINT@3
88,"D":PRINT@452,"E"
5120 PRINT@516,"F":PRINT@580,"G":PRINT@644,"H":PRINT@7
08,"I":PRINT@772,"J"
5130 FOR Y=10 TO 37 STEP3
5140 FOR X=22 TO 94 STEP 8
5150 SET(X,Y)
5160 NEXT X
5170 NEXT Y
5175 PRINT@0,"SCORE "A$,T;TAB(40);B$;O
5176 IF (Z=1)AND (S=2)=-1 THEN5185
5177 A=10:B=13:C=16:D=19:E=22:F=25:G=28:H=31:I=34:J=37
5178 IF S=2 THEN5183
5179 DEFINT L,P:PRINT@896,"
5180 PRINT@896 ,A$;"S TURN "NUMBER-LETTER";:INPUTN
,L$
5181 L=(ASC(L$)-57)+2*(ASC(L$)-64)
5182 GOTO5190
5183 PRINT@896 ,B$;"S TURN","NUMBER-LETTER";:INPUTN,
L$
5184 L=(ASC(L$)-57)+2*(ASC(L$)-64):GOTO5190
5185 PRINT@898 ,B$;"S TURN - LET ME TAKE A LOOK": RE
TURN
5190 PRINT@896," ", "END NUMBER-LETTER";:INPUTM,P$
5191 P=(ASC(P$)-57)+2*(ASC(P$)-64)
5200 GOTO1070
5490 CLS
5500 REM
5501 IF POINT(23+(N-1)*8,L)AND POINT(23+(N-1)*8,L+3)=-1
THEN5509
5503 IF POINT(23+(N-1)*8,L)AND POINT(23+(N-1)*8,L-3)=-
1 THEN5512
5506 GOTO5600
5509 IF POINT(22+(N-1)*8,L+1)AND POINT(22+N*8,L+1)=-1
THEN5522
5512 IF POINT(22+(N-1)*8,L-1)AND POINT(22+N*8,L-1)=-1

```

```

THEN5522
5513 GOTO5600
5515 IF POINT(22+(N-1)*8,L+1)AND POINT(22+N*8,L+1)=-1
THEN5518
5516 IF POINT(22+(N-1)*8,L+1)AND POINT(22+(N-2)*8,L+1)
=-1 THEN5519
5517 GOTO5600
5518 IF POINT(23+(N-1)*8,L)AND POINT(23+(N-1)*8,L+3)=-1
THEN5522
5519 IF POINT(23+(N-2)*8,L)AND POINT(23+(N-2)*8,L+3)=-
1 THEN5522
5520 GOTO5600
5522 IF S=1 THEN T=T+1:GOTO5175
5525 IF (Z=1)AND (S=2)=-1 THEN O=O+1:GOTO6000
5530 IF S=2 THEN O=O+1:+5175
5600 IF (Z=1)AND (S=1)=-1 THEN5560
5601 IF (Z=1)AND (S=2)=-1 THEN5565
5605 IF S=1 THEN5640
5610 IF S=2 THEN5650
5640 S=2:GOTO5175
5650 S=1:GOTO5175
5660 S=2:GOTO6000
6000 A=0:B=0:C=0:D=0:E=0:F=0:H=0:I=0:J=0:G=0
6001 S=2
6005 FOR Y=10 TO 34 STEP 3
6010 FOR X=22 TO 86 STEP 8
6015 A=X+1
6016 B=(X-14)/8
6040 E=POINT(A,Y)
6050 F=POINT(X,Y+1)
6060 G=POINT(X+8,Y+1)
6070 H=POINT(A,Y+3)
6090 IF (E=-1)AND (F=-1)AND (G=-1)AND (H=-1)=-1 THEN62
40
6100 IF (E=-1)AND (F=-1)AND (G=-1)=-1 THEN N=B:L=Y+3:M=B
+8:P=Y+3:GOTO1090
6120 IF (E=-1)AND (F=-1)AND (H=-1)=-1 THEN N=B+1:L=Y:M=B
+1:P=Y+3:GOTO1090
6130 IF (E=-1)AND (G=-1)AND (H=-1)=-1 THEN N=B:L=Y:M=B:P
=Y+3:GOTO1090
6140 IF (F=-1)AND (G=-1)AND (H=-1)=-1 THEN N=B:L=Y:M=B+8
:P=Y:GOTO1090
6175 IF (E=-1)AND (F=-1)=-1 THEN6240
6180 IF (E=-1)AND (G=-1)=-1 THEN6240
6190 IF (E=-1)AND (H=-1)=-1 THEN6240
6200 IF (F=-1)AND (G=-1)=-1 THEN6240
6210 IF (F=-1)AND (H=-1)=-1 THEN6240
6220 IF (G=-1)AND (H=-1)=-1 THEN6240
6225 IF (E=-1) THEN6240
6230 IF (F=-1) THEN6240
6240 NEXTX
6250 NEXTY
6260 N=RND(9)
6261 L=RND(9)*3 +10
6265 A=10:B=13:C=16:D=19:E=22:F=25:G=28:H=31:I=34:J=37
6270 GOTO1090
7160 N=B:L=Y:M=B+8:P=Y
7161 GOTO1090
7165 N=B:L=Y:M=B:P=Y+3
7166 GOTO1090

```

Program Listing 1



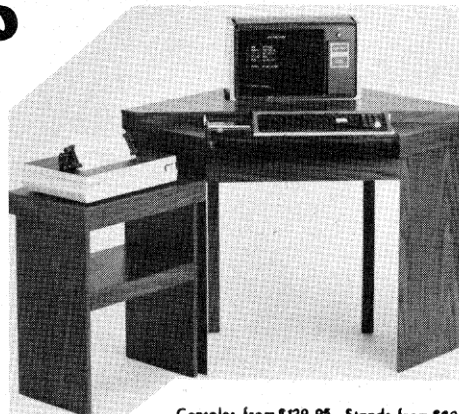
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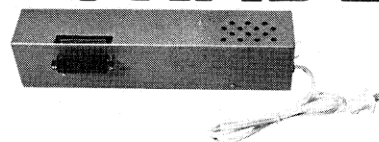


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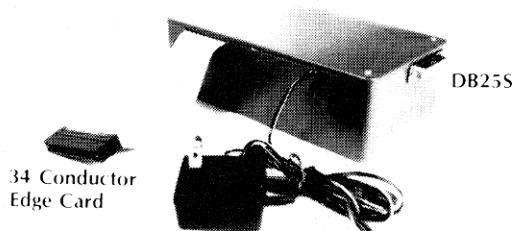
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If you have the bucks, this check writing routine is good to \$999,999.99.

Endorse It

Program Listing 1

```

10000 CLEAR500:INPUT"DOLLARS AND CENTS";X$
10005 P$="":P5$="":P4$="":P3$="":P2$="":P1$=""
10010 PB$=""
10020 L=INSTR(X$,PB$)
10030 XA$=LEFT$(X$,L):XB$=RIGHT$(X$,2):PC$=XB$+"/100"
10040 ON L-1 GOTO 10150,10140,10130,10120,10110,10100
10090 REM DIGITAL SEPARATION
10100 X6$=MID$(XA$,L-6,1)
10110 X5$=MID$(XA$,L-5,1)
10120 X4$=MID$(XA$,L-4,1)
10130 X3$=MID$(XA$,L-3,1)
10140 X2$=MID$(XA$,L-2,1)
10150 X1$=MID$(XA$,L-1,1)
10170 ON L-1 GOTO 10450,10400,10350,10300,10250,10200
10180 ON L-1 GOSUB 10600,10650,10700,10750,10800,10850
10190 END
10200 X6=VAL(X6$)
10210 ON X6 GOSUB 11001,11002,11003,11004,11005,11006,11007,11008,11009,11010
10220 P6$=P$+"HUNDRED "
10250 X5=VAL(X5$):P0$=""
10260 ON X5 GOSUB 12000,12002,12003,12004,12005,12006,12007,12008,12009,12010
10270 P5$=P0$
10300 X4=VAL(X4$):P$=""
10310 ON X4 GOSUB 11001,11002,11003,11004,11005,11006,11007,11008,11009,11010
10320 P4$=P$+"THOUSAND "
10350 X3=VAL(X3$):IF X3=0 THEN 10400
10360 ON X3 GOSUB 11001,11002,11003,11004,11005,11006,11007,11008,11009,11010
10370 P3$=P$+"HUNDRED ":P$=""
10400 X2=VAL(X2$):P0$=""
10410 ON X2 GOSUB 10905,12002,12003,12004,12005,12006,12007,12008,12009,12010
10420 P2$=P0$
10450 X1=VAL(X1$):P$=""
10460 ON X1 GOSUB 11001,11002,11003,11004,11005,11006,11007,11008,11009,11010
10470 P1$=P$
10480 GOTO 10180
10600 PRINT P1$;"AND ";PC$
10610 RETURN
10650 PRINT P2$;P1$;"AND ";PC$
10660 RETURN
10700 PRINT P3$;P2$;P1$;"AND ";PC$
10710 RETURN
10750 PRINT P4$;P3$;P2$;P1$;"AND ";PC$
10760 RETURN
10800 PRINT P5$;P4$;P3$;P2$;P1$;"AND "PC$
10810 RETURN
10850 PRINT P6$;P5$;P4$;P3$;P2$;P1$;"AND "PC$
10860 RETURN
10905 X1=VAL(X1$):IF X1=0 THEN P2$="TEN ":P1$="":GOTO 10180
10910 ON X1 GOSUB 13001,13002,13003,13004,13005,13006,13007,13008,13009

```

Arthur J. Welcher
360 S. Wetherly Drive
Beverly Hills, CA 90211

My friend was telling about his latest acquisition, a check writing program. I asked him what it did, and got the obvious answer, "It writes checks!"

"What do you put in?" I asked. "Everything," he answered. "Why not just spindle a blank check into your printer and type out the check?" I asked.

"You sound just like my wife," he answered, and walked away.

It got me thinking about including a check writing program as a part of my own General Ledger program. After all, my cur-

```

10915 P2$=PP$:P1$=""
10920 GOTO 10180
10930 X4=VAL(X4$):IF X4=0 THEN P5$="TEN ":P4$="":GOTO 10320
10935 ON X4 GOSUB 13001,13002,13003,13004,13005,13006,13007,13008,13009
10940 P5$=PP$:P4$=""
10945 GOTO 10320
11000 REM
11001 P$="ONE ":RETURN
11002 P$="TWO ":RETURN
11003 P$="THREE ":RETURN
11004 P$="FOUR ":RETURN
11005 P$="FIVE ":RETURN
11006 P$="SIX ":RETURN
11007 P$="SEVEN ":RETURN
11008 P$="EIGHT ":RETURN
11009 P$="NINE ":RETURN
11010 P$="":RETURN
12001 P0$="TEN ":RETURN
12002 P0$="TWENTY ":RETURN
12003 P0$="THIRTY ":RETURN
12004 P0$="FORTY ":RETURN
12005 P0$="FIFTY ":RETURN
12006 P0$="SIXTY ":RETURN
12007 P0$="SEVENTY ":RETURN
12008 P0$="EIGHTY ":RETURN
12009 P0$="NINETY ":RETURN
12010 P0$="":RETURN
13000 REM TEENS
13001 PP$="ELEVEN ":RETURN
13002 PP$="TWELVE ":RETURN
13003 PP$="THIRTEEN ":RETURN
13004 PP$="FOURTEEN ":RETURN
13005 PP$="FIFTEEN ":RETURN
13006 PP$="SIXTEEN ":RETURN
13007 PP$="SEVENTEEN ":RETURN
13008 PP$="EIGHTEEN ":RETURN
13009 PP$="NINETEEN ":RETURN
13010 PP$="TEN ":RETURN

```

rent program makes all the calculations for payroll checks and accepts the entry of accounts payable checks. Why isn't check writing a part of any program of this kind?

One look at a blank check immediately gave me the answer. The blank check calls for the check number, the date, the payee, my signature, and the amount in two places, once in Arabic number form and again in English word form. That's it!

Most programs are confined to mathematics or word processing, but a printed check needs a translation from numerics to the written word.

Limitless Checks

I decided to do something about it. I had seen a check that was marked "not valid over two hundred dollars", so it was possible to have a practical limit on the translation. I wanted more room in the program, so I set my limit six places to the left of the decimal point, or "not valid over 999,999.99 dollars". That

wouldn't exclude too many check applications.

I gave the program a high starting line number so that it can be merged with an existing program and used as a subroutine. The program is a bit over 2K in length and requires about 130 bytes to execute.

Lines 10010 to 10030 count the columns to the left of the decimal point.

Lines 10100 to 10150 assign a string name to each column. Then, working in reverse, lines 10200 to 10460 do the actual translation decisions, with lines 11001 to 13010 supplying the words, and lines 10600 to 10860 printing the processed number into English.

You must include the two numbers that denote cents. It is necessary to have two digits to the right of the decimal point, even if they are zeros.

Now, to test the program, place a blank check into your printer, and write a check to the author. Any figure up to 999,999.99 is possible. ■

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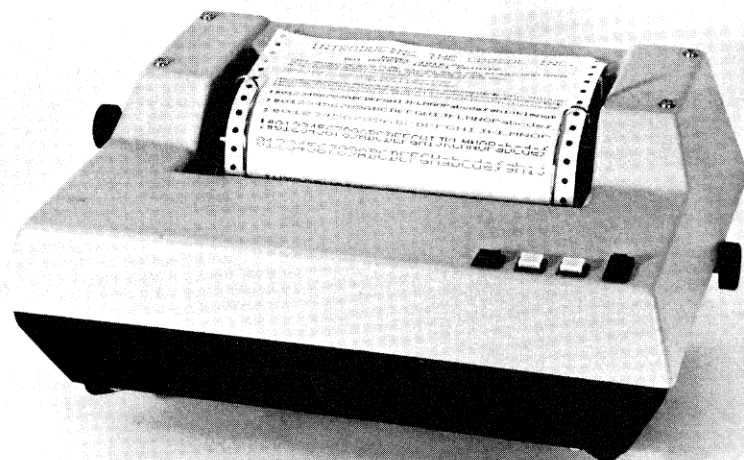
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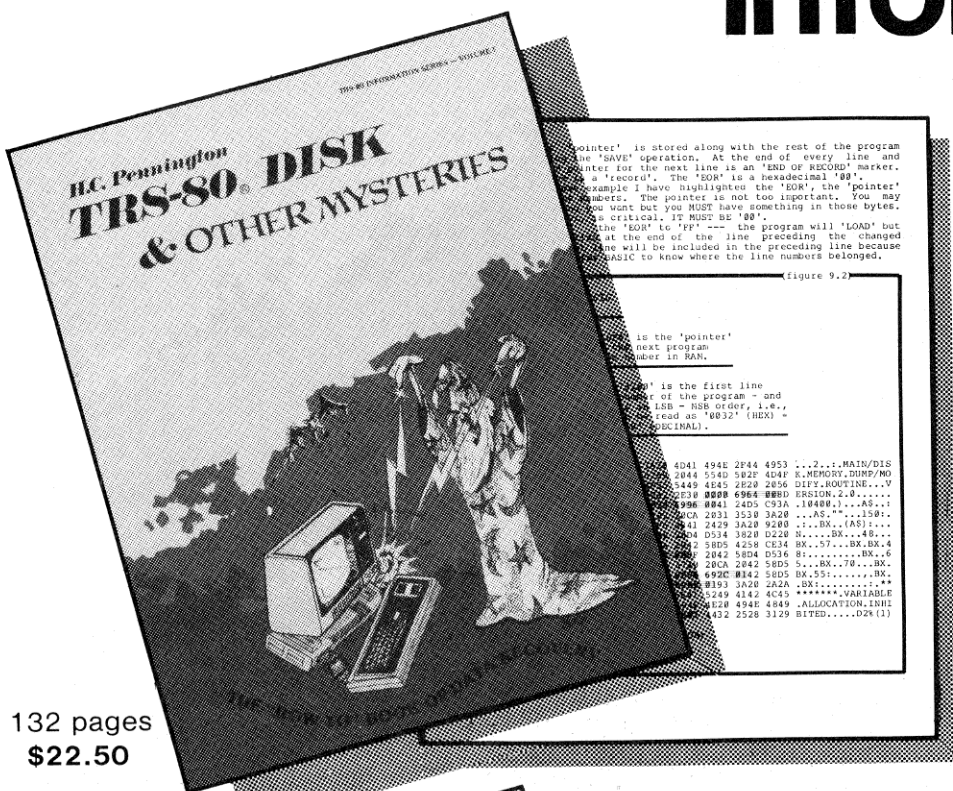
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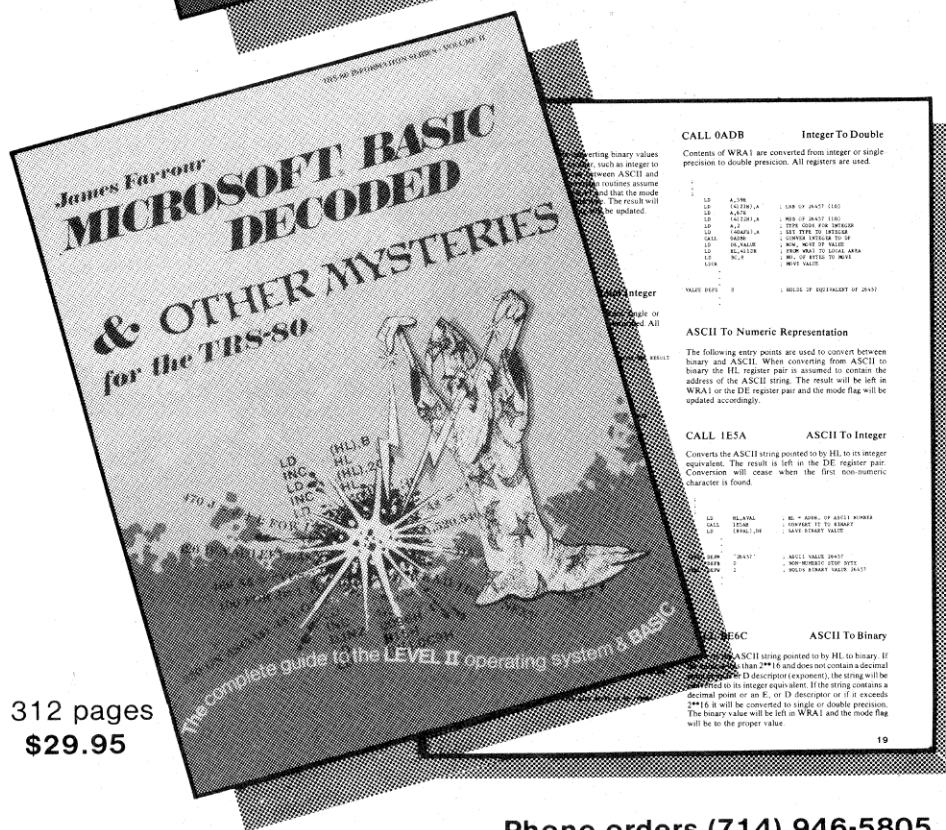
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The Model I 1/2

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Do you own an Exatron Stringy Floppy? Are you tired of having to plug in two ac power cords *plus* a transformer just to power up your system?

Would you like to have a portable system with only one cord?

If the answer is yes, and you are a hobbyist with some electronics experience, you'll like this article. I'm going to tell you how I modified my TRS-80 video display to house the Stringy Floppy and the power supply for the TRS-80 keyboard.

Be prepared to spend a couple of evenings installing the modifications. The job is not difficult, but it is time consuming. And before you start, a gentle reminder: *this will void the warranty on the Stringy Floppy and the video display unit.*

You will notice in the photos that the Stringy Floppy is mounted vertically. This does not impair its operation.

Preliminaries

Before you tackle this project,



remove one of the rubber feet from your keyboard power supply. Check to see if there is a Phillips head screw under the foot. Early versions do not allow access to the supply. If your supply does not have the screws, take it to your Radio Shack store and have it replaced with the newer version.

You also need a longer bus cable than the one on the Stringy Floppy. I ordered one from Hobbyworld Electronics, Inc. for less than ten dollars. Next you will need a brace to mount the Stringy Floppy to the video display cabinet. I used a

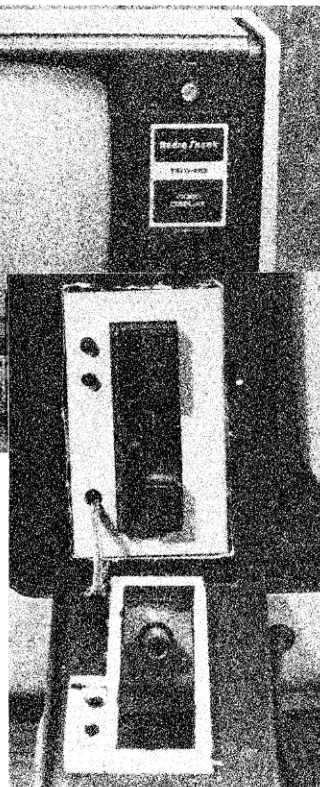
metal foundation anchor purchased at a local hardware store. It required some bending and cutting to make into a suitable brace, but serves the purpose.

Lastly, you'll need some assorted sizes of balsa wood and some rubber grommets.

When your new cable arrives, take the covers off the Stringy Floppy unit with a 3/16 inch nutdriver or common screwdriver. Discard the plastic side and metal top covers. They will not be used. Now comes the tedious part. Remove the top of the bus connector at the PC board. This allows you to remove the ribbon cable. Be sure to note the direction of the red stripe.

If you can, press on the new ribbon cable in place of the old one.

This normally takes a special tool. If you can't press on the new cable, then it will be necessary to cut the ends of the ribbon cable to match the notched connector. Then strip 1/32 inch of each strand of ribbon. Tin each wire and place the ribbon cable in place. Solder each strand to the appropriate notch of the connector. With this completed, connect the new bus cable to the keyboard and thor-



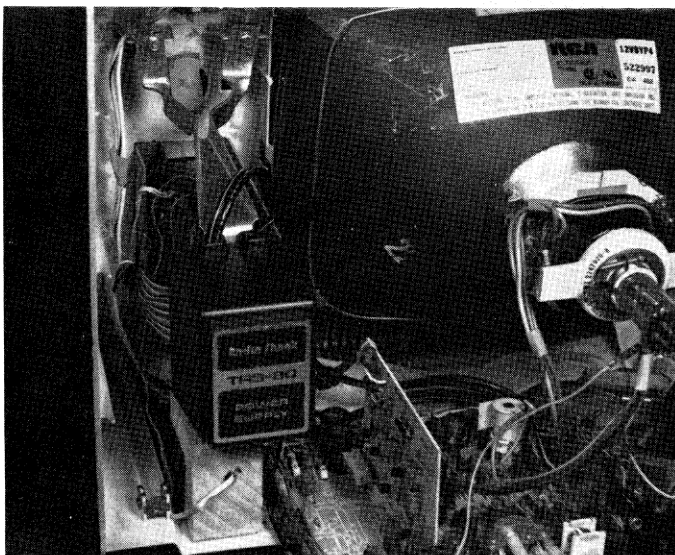


Photo 1. Stringy Floppy Unit Installed with Wood Block Supporting Power Supply

oroughly test the Stringy Floppy unit.

Video Cabinet

Remove the rear cover of the video display with a 1/4-inch nut-driver. The Radio Shack logo panel cover will have to be removed by cutting four tabs from the inside of the cabinet. Now comes the hard part: making that first cut into your cabinet. You will need a coping saw blade that is made for cutting plastic. All cutting will be done by hand with only the blade. If you have a keyhole saw with a fine blade, this would work better.

Mark off the area to be cut.

The Stringy Floppy case must fit 1/16 inch from the bottom of the ridge as viewed from the front of the display, and 9/16 inches from the right hand side of the ridge. You need to cut a rectangle 2 1/4 inches by 3 7/8 inches. The top of the Stringy cabinet should end up 1/16 inch from the bottom of the upper plastic tuner circle. It is best to cut slightly under size, and then file to exact fit. Place the Stringy Floppy from the back of the display into the cutout frequently while filing to insure the tightest fit.

When the filing is complete, start on the brace. The video display cabinet has two holes for mounting tuners. The brace

should be fashioned to mount to these two holes and then fasten to the rear of the Stringy Floppy case.

I used the existing holes in the Stringy case to fasten the brace. It may help to cut a block of balsa wood to fit under the case. This will help hold it in place while you work out the brace. Later, this block of balsa will also serve to hold the transformer that powers the Stringy.

When the brace is completed, cut the balsa block to fit over the Stringy transformer (Photo 1). Then drill a 1/4-inch hole in one end to allow the ac power cord an exit. Unsolder the ac wires at the PC board and run the ac cord through the hole just drilled. Since you will not be needing a long ac cord, cut the wire to a shorter length and resolder it to the PC board.

Next, install a rubber grommet in the newly drilled hole. Pick a grommet with an inside diameter just slightly larger than the power cable.

Now, take the power cable connector off. Use a screwdriver to press in the tabs while you slide the cover off. Unsolder the wires to the power connector, making sure you know where to put them back. Slip the power cord through the grommet and resolder the connector. Put the contrast and brightness bracket back in place.

Mounting the Power Supply

On the bottom of the power supply are four rubber feet. Remove them and you will find four Phillips screws which secure the top half of the power supply. Remove the screws and drill a 1/8-inch hole in the base of the

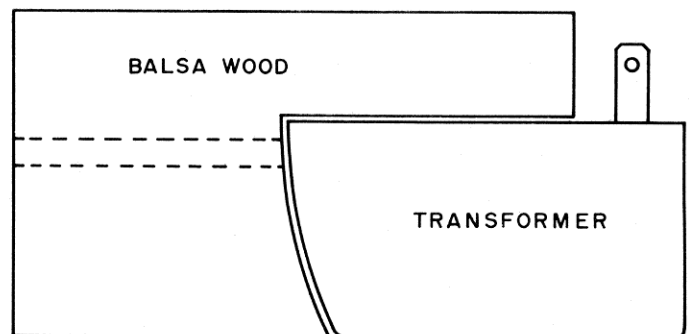


Fig. 1. Balsa Block Cut to Fit Around Transformer

Next comes the power supply. First, you will need a hole in the video display cabinet for the power supply cable. Remove the contrast and brightness knobs. They pull off from the front.

Remove the two screws which hold the knob bracket in place. Now, remove the cable clamp that holds the video cable secure. Slip this clamp back to the PC board where the cable originates. The video cable should now slide freely in the plastic grommet.

Next, drill a 5/16-inch hole in the video cabinet for the power cable. Drill from the back of the cabinet out. I drilled my hole in the center of a protrusion in the plastic directly in line with the contrast and brightness controls.

power supply at the point between the exits of the ac power cord and the dc power cable. This hole allows you to mount the power supply to the rear of the Stringy case at the same place where the bracket mounts.

With the power supply mounted, put the upper half of the supply back on and install two of the four screws you removed and two of the rubber feet. There is not enough room to put all four back on with the supply attached to the Stringy case.

Cut the ac power cord so that it is about one foot long. Cut another one-foot section from the left over cord. This will be used to connect power to the Stringy transformer.

Now, locate the terminal strip on the video chassis as shown in Photo 2. This terminal strip

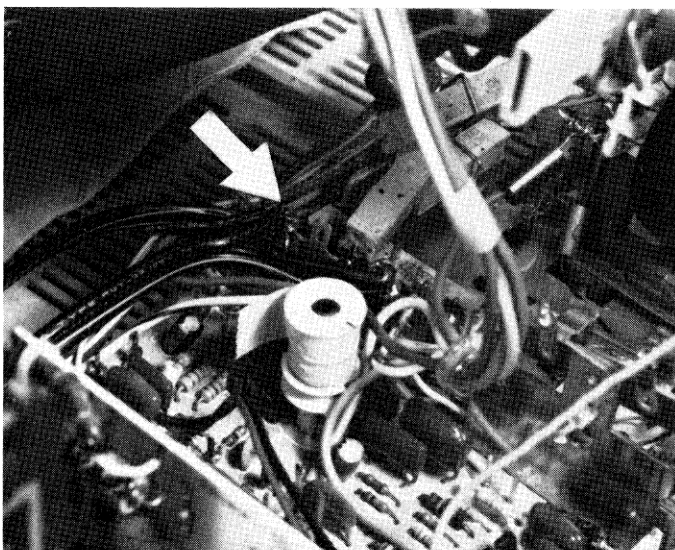


Photo 2. Arrow Points to Terminal Strip on Video Chassis.

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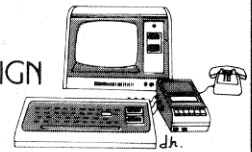
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has six lugs and is directly in front of the terminal strip that has the two fuses mounted.

Strip and tin 1/4-inch of the ac power cord for the power supply and the extra one-foot section. Connect one side of each of the two power cords to lug 1 (closest to the front of the video cabinet). Solder in place. Connect the other side of each of the two power cords to lug 4.

If you are not sure where these lugs are located, use an ohmmeter across the lugs in question. You should read 110 V ac when the power switch on the video monitor is pressed to on.

Strip and tin 1/2-inch from the remaining ends of the extra one-foot power cord and wrap it around the ac power prongs of the Stringy Floppy transformer. Solder these wires to the prongs and wrap with electrical tape.

Take the balsa wood block that you used earlier and cut out a section for the transformer (Fig.1). Glue the transformer to the balsa block. Because of the porous nature of the balsa wood, I used a rubber sealant and adhesive such as is used around bathtubs. This same adhesive can be used to glue the balsa block and transformer to the video cabinet (see Photo 1). Not all adhesives will stick to the video cabinet.

Bus Cable

Drill a series of small holes in the recessed area on the left side of the cabinet under the video screen for the bus cable to exit. File this to size so that the cable can be brought out the front of the display. You must shield the cable to prevent noise from causing bad loads. This can be done by wrapping aluminum foil around the cable from a point three inches from the beginning of the cable at the PC board, to the point where the cable exits the video cabinet.

Now, take a six-inch piece of wire and strip the insulation back one inch at one end. Lay this end of the wire on the aluminum foil. Wrap masking tape or electrical tape around the foil for the length. This will secure the ground wire and prevent shorting out any components on the video board.

Strip about a half-inch from the other end of the ground wire. Attach this under one of the screws which hold the PC board to the Stringy case (one of the two near the bus connector). Run the bus cable under the Stringy case and along the bottom of the video cabinet and out the bus exit opening. Fasten the Stringy Floppy in place with the bracket.

Before you test the Stringy Floppy, make sure that the bus cable is plugged into the keyboard, with pin one of the cable to pin one of the connector. Turn on the power and load a program from a good wafer. If your bus cable is shielded properly, you should have no problems. If you are getting parity errors, go back and check the shielding. If errors persist, recheck everything.

Logo Panel Cutout

When you are satisfied, it is time to cut out the cover to fit over the Stringy Floppy. (See Photos 3 and 4.) Be careful because mistakes will show on the finished product.

This cutout will require a 15/16 inch by three-inch cut for the wafer opening and a 3/8 by one inch opening for the LEDs. The cutout for the wafer opening should start about 1/32 inch from the bottom of the Radio Shack logo.

When these have been made, cut strips of balsa wood to fit around the opening on the inside of the panel. These can be glued in place and painted flat black. If you have scratched the paint where the bus cable exits, the flat black paint will provide a good cover. If the opening for the Stringy Floppy is a tight fit, the logo panel should fit back into place. However, if the logo panel is loose, secure it with some fastener. One method would use Velcron material, or another might use an adhesive to glue it in place.

Wrap Up

All that's left is to put the rear cover back in place. Of course, you'll probably want to invite your friends over to show off, and, why not? You deserve to be a little proud. ■

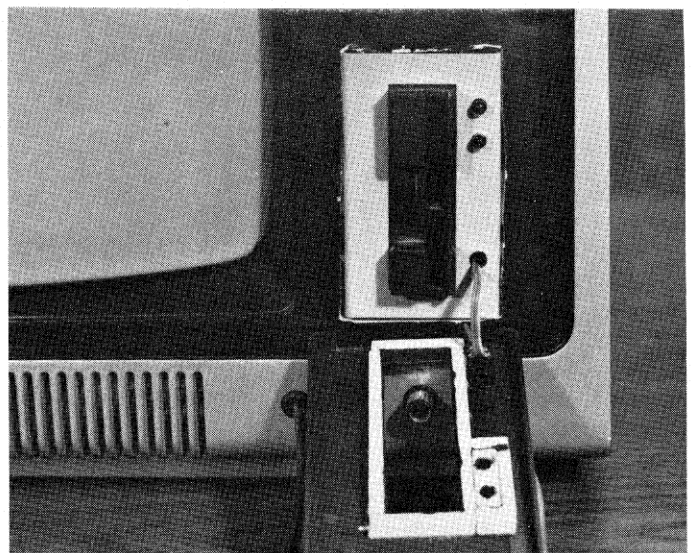


Photo 3. Logo Panel Cut to Fit Over Stringy Floppy

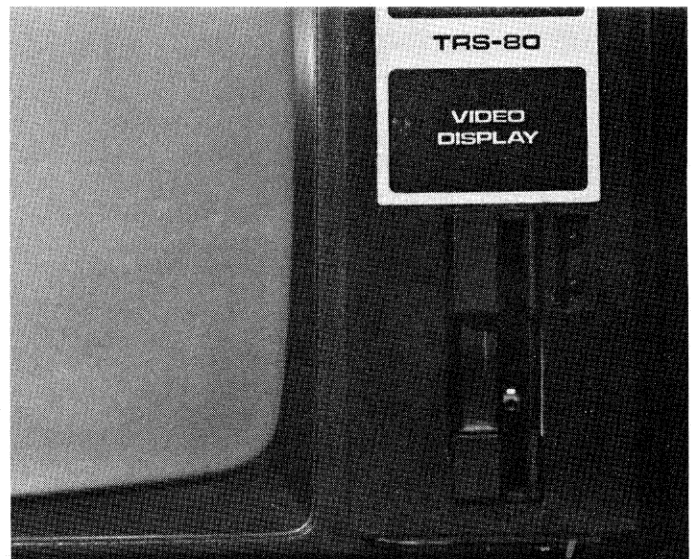


Photo 4. Close-up of Installed Unit

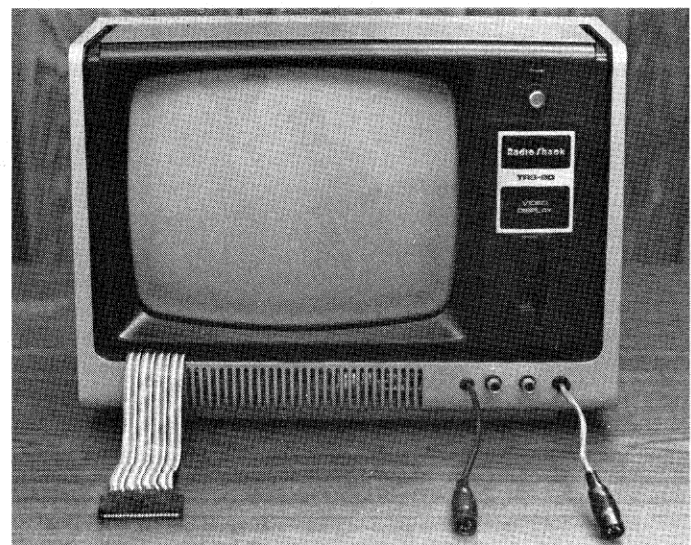


Photo 5. TRS-80 with Stringy Floppy Unit Installed

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for a TRS-80 disk drive. At that time I was faced with writing a report that ran to about 30,000 words. I was equipped with a 32K TRS-80 with expansion interface and a Selectric-type printer, but no disks. I had Shroyer's Electric Pencil and had made the recommended modification for lowercase.

While my system cost a lot more than \$2000, it didn't function much differently than cheaper systems. I wasn't wildly enthusiastic about preparing a lengthy report on a cassette-based system, in view of the loading problems and sticking relays then prevalent. But, I was more than pleasantly surprised to discover I had an effective and useful system that not only did the job, but did it efficiently.

I can almost hear the voices out there saying, "He's out of his gourd! Ya just gotta have disks." Well, ya don't. Disks are nice; I have them and rarely use the cassettes. But I found that with experience, a cassette-based word processing system is not as handicapping as you might imagine.

Certain things have made the assembly of a low cost system possible. First is the reduction in price of the basic 16K Level II TRS-80. Second, you can now buy a printer interface cable that costs only \$59. Finally, competition and the expanded market

have reduced the price of printers substantially.

If you can assemble a cassette-based system for under \$2000, a legitimate question is: how much does being limited to cassettes for external storage affect the user?

Limits

Consider the lowest cost approach: using the printer interface cable, effectively restricting the user to the 16K RAM in the keyboard. The first limitation to the system is the number of words or pages which can be stored in active memory.

If I were optimizing a 16K system, I would pick Electric Pencil, which is about 4K long. Scriptsit is much longer, leaving less memory for your text. You will have more memory if you opt for the expansion interface + 16K RAM instead of the printer interface cable. But, if the \$350 more is important, you can do significant writing with approximately 1000 words in memory at a time. Limited memory is not a loss in output capability, but an increment of additional time and effort to accomplish the output.

Time and Effort

Operating with limited memory, you will have to save text on tape fairly often, which is a good habit to get into anyway, to avoid losing text in the event of

power failure or drain.

I partially offset the lost ability to immediately review text on-screen by printing out a draft before I make the tape save. I can thus review the older text from the printed version while the later text is on-screen. The printed copy is also insurance against calamity during or after the save.

Draft printing has another advantage: I usually draft text in the same format as the final copy, allowing me to get a picture of pages as a whole and to reorganize tape saves to begin and end with certain pages or sections. Pencil's ability to append text from tape to text in memory allows you to reorganize the initial tape saves to suit the organization of your paper.

General Observations

My CTR-41 was modified to provide an audible tone as text is being moved to or from the recorder. This is a mod you can do yourself if you are skilled. It is, in my view, one of the best investments you can make. It not only makes it easy to locate the beginning or end of recorded text, but allows you to turn your attention to other tasks. The tone cues you when the load is finished.

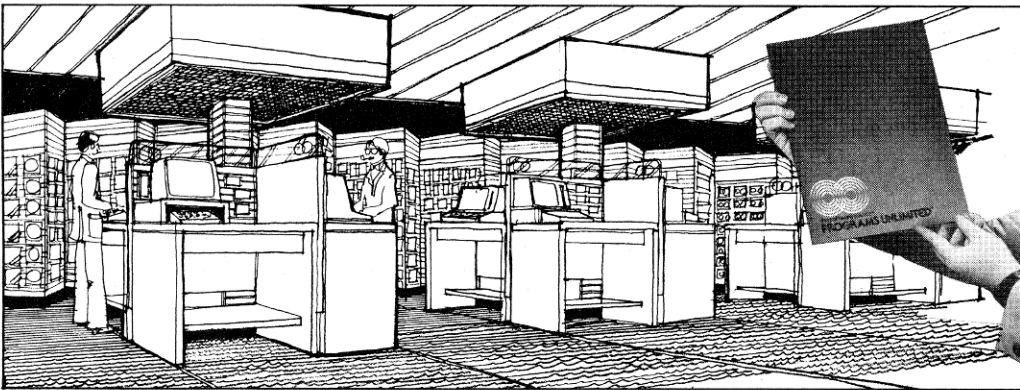
Use a log when saving text on tape, and note the following in it: the tape name or number and

The prevalent conventional wisdom is that word processing has arrived. Where conventional wisdom goes wrong is in the belief that useful word processors cost \$10-15,000. I believe that this misconception fails to consider a class of word processing systems which can be put together for under \$2000. Because of the lack of awareness of the availability of these systems, many teachers, college professors and students, small businesses, authors, and others may miss a system which is affordable and useful.

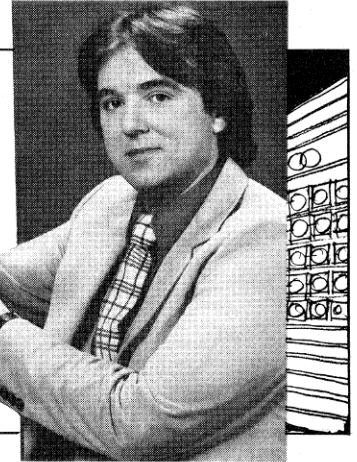
My own views originally stem from those dark early days when one had to place an order, pray a lot, and wait at least six months

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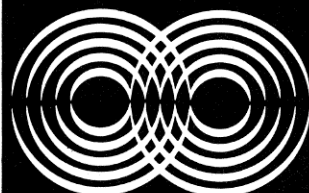
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side used; the starting and ending CTR counter number; identification of the content of the save; and the word count and record count of the Pencil text.

Use the log to locate the right tape and side, then the counter in conjunction with the audible tone to locate the start of the text. Then load the text; if the word and record count are the same, you probably have a good load of the correct section of text. These techniques are a useful offset to the inability to name text files for loading, saving, and directory functions, that are available with disk operations.

The Printer

You would probably want a daisy-wheel or thimble-type letter quality printer which list at around \$3000, making them only the stuff of dreams for most of us. If you concede the letter quality print requirement, there are a number of dot-matrix printers in the \$500-800 range that do a nice job.

| | |
|---------------------------------|-----------|
| ● TRS-80 16K Level II w/keypad | \$849.00 |
| ● Printer Interface Cable | 59.00 |
| ● Lowercase Mod for TRS-80 | 59.00 |
| ● Comprint 912GP w/cable | 599.00 |
| ● Electric Pencil (tape) | 99.00 |
| ● Radio Shack Space Saver Desk | 49.95 |
| ● 2-300' Rolls Comprint Paper | 19.00 |
| ● Radio Shack Power Line Filter | 39.00 |
| ● Total | \$1772.95 |

Table 1

I like the Comprint 912GP. It is available at around \$600 and uses a 9 x 12 dot matrix to electronically remove an aluminized coating from a black base roll paper, at 225 characters per second. It's fast, prints upper and descending lowercase, the finished copy has a nice appearance (black letters on silver paper), and when it is copied, the 9 x 12 matrix is fine enough to make the copy look like a typed original. The paper comes in 8 1/2" wide rolls and the cost is slightly higher than white fanfold. You don't have to buy rib-

bons, so you come out about even, but without inky fingers or print density varying with the age of the ribbon.

There are other printers you might want to look at depending on your needs, finances, and skills. Centronics has announced their Model 737 which has an N x 9 dot matrix capability alleged to give letter quality printing, and lists around \$1000. Radio Shack has announced that it will offer a nearly identical printer for the same price.

If you are a skilled tinkerer and must have letter quality,

consider purchasing a used Selectric and convert it using the Escon or similar kit. You might even find a used Selectric-type printer in your price range. I urge caution in printer selection—the wrong one can cause you trouble.

A Sample System

Table 1 is a selection of components that might make up an inexpensive system. The costs are either list or generally advertised prices.

If you purchase the listed system or a similar one, you will have a useful word processing system. The only sacrifice you will make over an expensive model is in the quality of the printed characters.

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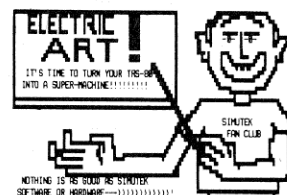
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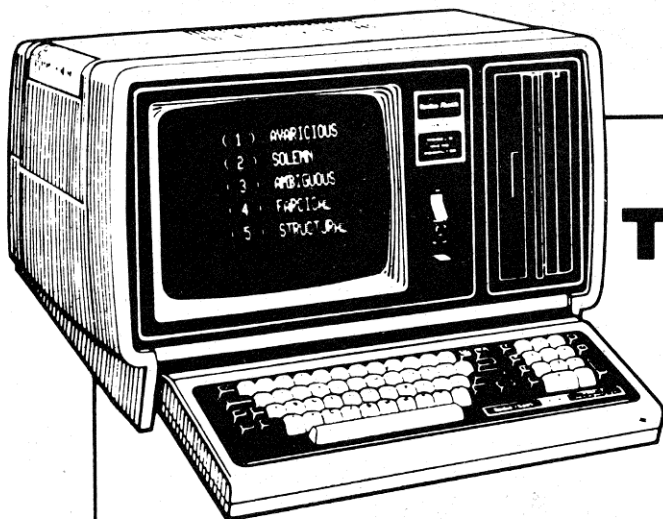
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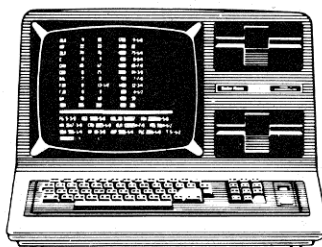
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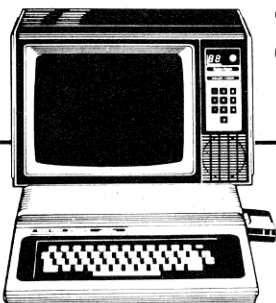
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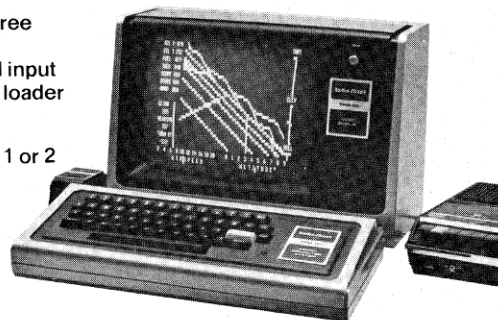
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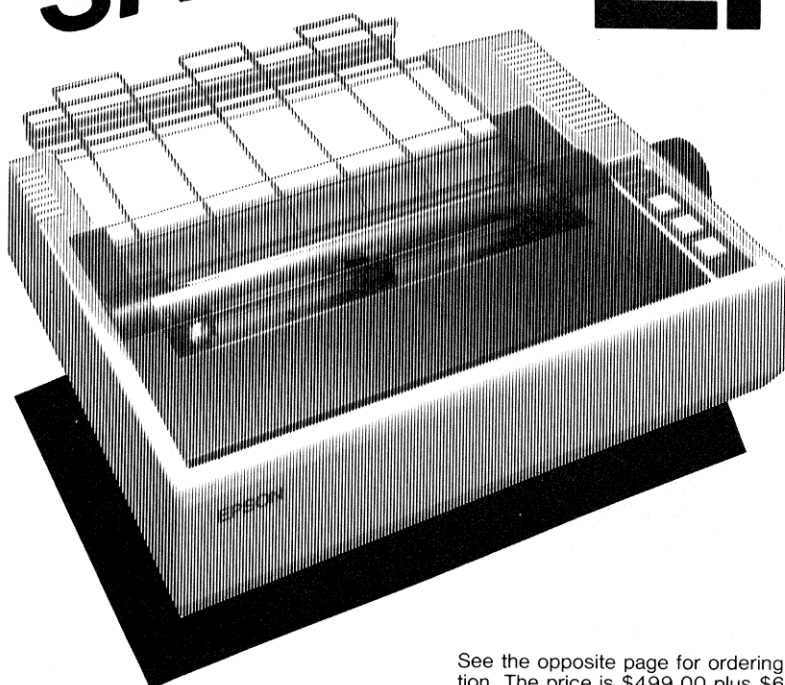
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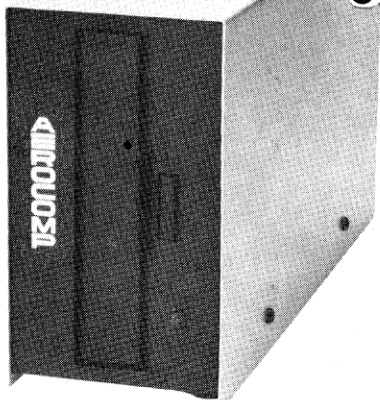
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● **TRACK DENSITY** Specified in tracks per inch (TPI). Refers to the number of tracks per radial inch on the diskette. Typically 48 TPI=40 usable tracks and 96 TPI=80 usable tracks.

● **DOUBLE DENSITY** Refers to recording density in bits per inch (bpi). Typically single density means data can be recorded up to 2,938 bpi; double density means data can be recorded up to 5,876 bpi.

● **DOUBLE SIDED** Refers to number of read/write heads. Single-sided is one head, read/write one side only; double-sided is dual heads allowing read/write operations on both sides of the diskette. A double sided drive appears as two separate drives to the controller. (Model 80-2 & 160-2)

● **ACCESS TIME** The time required for the head to move from one track to the next. Typically 5 to 40 milliseconds (ms).

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| PERCOM | YES | 25ms. | YES | NO | 250K bytes (both sides) | YES | NO |
| MPI | NO | 5ms. | YES | YES | 125K bytes | YES | NO |
| SHUGART | NO | 40ms. | YES | NO | 109K bytes | NO | NO |
| TANDON | NO | 5ms. | NO | NO | 125K bytes | NO | NO |

Factual material from current manufacturer's data sheets is believed reliable but cannot be guaranteed, comparing Aerocomp Model 40-1 to similar models.

The TRS-80* expansion interface limits the track to track access time to 12ms.

*Trademark of Tandy/Radio Shack.

Take your screen printer and 80 to the land of the low for less than \$10.

Lower Cost Lowercase

Philip M. Van Praag
PO Box 35667
Tucson, AZ 85740

This article describes a lowercase modification and a KB fix for the Radio Shack Screen Printer, as well as a companion lowercase display modification for the TRS-80. These hardware modifications, unlike Radio Shack's, should cost less than \$10.

Background

Both the TRS-80 and the Screen Printer contain character generator ICs that are capable of producing lowercase characters. What prevents them from doing this is the manner in which they are addressed.

Before we can describe the address control, however, let's explain the ASCII code used to select character generator outputs.

Table 1 contains the ASCII bit code for numbers, symbols and uppercase/lowercase characters. Each binary bit is either a zero (logic level low) or a one (logic level high). These highs and lows provide unique ad-

dresses which tell the character generator which character is needed. The bits to note are 5 and 6.

Notice that the only difference between the uppercase and lowercase versions of the same letter is that bit 5 is always a zero (low) for the uppercase and a one (high) for the lowercase.

Also, bit 6 is always high for letters, and low for numbers and symbols.

In the TRS-80 design, this eliminates the need for a bit 6 video storage IC (called a RAM).

TRS-80 ROM ICs decode each keyboard entry via an internal lookup table, and send the ASCII code to video RAM. Since the ROM output to video RAM never contains lowercase letters, bit 5 is high only when a number or symbol is present. Thus, bit 6 is not needed in this "uppercase only" application.

The Screen Printer prints exactly what you see on the monitor screen; that is, it prints the contents of the video RAM memory. Since the TRS-80 initially does not contain stored lowercase data (does not store bit 6), the Screen Printer synthesizes its own bit 6 for addressing its character generator IC. Since it only has to print uppercase let-

ters and numbers/symbols, it synthesizes bit 6 by inverting bit 5.

The Scripsit program apparently contains its own lookup table to provide ASCII addressing for video RAM, thus providing lowercase letter addresses. All we need to do to modify the TRS-80 for lowercase display is to add a RAM IC to enable storage of bit 6 information.

Due to the bit 6 decoding technique used in the TRS-80, enabling the normal ASCII bit 6 function disables the graphics function. This is overcome by

providing a switch to select uppercase/graphics or uppercase/lowercase.

Modifications

The Screen Printer lowercase modification involves disabling the bit 5-to-bit 6 inversion and replacing it with the real bit 6 address line. Implementing the lowercase disables the graphics feature, so again we provide a switch to select graphics or lowercase. The printer must latch the incoming data from video RAM. We are now bringing in bit 6, and we must provide a data latch for

| 6_5 | 0_{10} | 0_{11} | 1_{10} | 1_{11} | 1_{10} | 1_{11} |
|-------|---------------------|----------|--------------------|----------|--------------------|----------|
| | Numbers/ Symbols | | Uppercase Alpha | | Lowercase Alpha | |
| 3210 | | | | | | |
| 0000 | (SP) | 0 | @ | P | \ | P |
| 0001 | ! | 1 | A | Q | a | q |
| 0010 | " | 2 | B | R | b | r |
| 0011 | # | 3 | C | S | c | s |
| 0100 | \$ | 4 | D | T | d | t |
| 0101 | % | 5 | E | U | e | u |
| 0110 | & | 6 | F | V | f | v |
| 0111 | ' | 7 | G | W | g | w |
| 1000 | (| 8 | H | X | h | x |
| 1001 |) | 9 | I | Y | i | y |
| 1010 | * | : | J | Z | j | z |
| 1011 | + | ; | K | | k | |
| 1100 | , | < | L | | l | |
| 1101 | - | = | M | | m | |
| 1110 | . | > | N | | n | |
| 1111 | / | ? | O | | o | |

Table 1. ASCII code for numbers/symbols and uppercase/lowercase letters.

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this bit. Rather than adding a new device to the circuitry, alter the operation of an existing data latch, one that is not used for non-graphics functions.

One additional Screen Printer/ TRS-80 modification must be made to print with programs containing keyboard debounce (such as Scripsit).

Upon receiving a print request, the printer initiates the following sequence: TRS-80 CPU activity stops; CPU data and address outputs are disabled; the printer's next video RAM location is provided on the address bus; the video RAM output data is latched in the printer; and, finally, data is fed through the character generator and out to the print head.

The printer goes through this cycle for each of the 1024 screen character positions (16 lines of 64 characters each) every time a print is initiated.

Normal printer cycle operation disables the CPU's output to the data bus. It does not disable main RAM's output. Main RAM plays an active role in keyboard debounce routines. It is frequently addressed by the CPU when the printer takes control of the bus structure.

Once a print command has been initiated, the printer must print something at every character location. If the printer cannot seize control at the right instant, such as when the CPU is addressing main RAM, the print cycle will not occur for that character. Thus the character generator will print a null (a special character consisting of all low ASCII bits). To correct this problem, make two simple circuitry changes.

First, in the printer, alter the requirement that the CPU be in the ROM-read state in order for the printer cycle to begin. This is done by disabling a couple of diodes allowing the print cycle to begin even if the CPU is addressing RAM. Second, eliminate main RAM's contributing to the data bus (when all we want is video RAM), by utilizing an unused gate in the TRS-80. This disables the main RAM output buffers at the proper time.

Before proceeding with the

modifications, check that you have all the parts and tools listed in Table 2. If you complete the mod and reassemble the equipment in one session, you will increase your chance of success.

Most Difficult

The most difficult task in the printer modifications is gaining access to the main logic board.

Although well-constructed with ample connectors, disassembling the board conjures up analogies to the old Chinese puzzle trick. All you have to do is follow this step-by-step procedure:

- 1.) Disconnect AC power and the interface cable.
- 2.) Open the hinged lid and

| Parts | |
|-------------------------------------|--|
| SPDT Switch, miniature toggle | |
| 4PDT Switch, miniature toggle | |
| 21L02 IC, static RAM 1024 x 1 | |
| 1N914 or 1N4148 Diode, silicon | |
| 1.2 kohm Resistor, 1/4 watt | |
| 10 feet wire, #30 AWG sold | |
| Tools | |
| Miniature diagonal cutters | |
| Needle-nose pliers | |
| 35 Watt soldering iron, fine tip | |
| .031 inch solder | |
| Drill and bits (for switch mtg.) | |
| Phillips screwdriver, #1 | |
| Xacto knife | |
| Hex drivers, 3/16 inch and 1/4 inch | |

Table 2. Parts and Tool Requirements

remove the paper roll and two spindles.

- 3.) Turn the unit upside-down, and remove the six 3/16-inch hex screws.

- 4.) Turn the unit right-side-up, and remove the four Phillips screws which attach the print mechanism housing to the full-length main chassis.

- 5.) Slowly lift the housing. This will uncouple a fixed multi-pin connector. Reach underneath the housing, and unplug the small cable connector. Set the print mechanism aside.

- 6.) Remove the two 3/16-inch hex screws and brackets which attach the plastic power supply cover. Remove this by lifting it up and toward the rear.

- 7.) This exposes two 1/4-inch hex screws on the main chassis

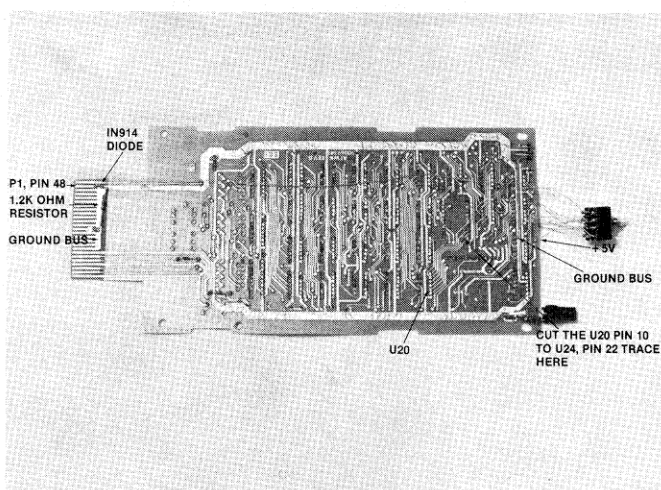


Photo 1. Underside of Printer Logic Board. Cut the pin 48 circuit trace at the ground bus before soldering diode in place.

next to the power supply board. Remove these.

- 8.) Slide the main chassis to the rear until the print toggle switch lever clears the bottom housing. Then slowly lift the front of the chassis until you can disconnect the small LED connector on the underside.

- 9.) Lift the chassis rear so you can disconnect the remaining two wires: one at the fuseholder, the other at the power switch.

The main chassis should now be completely separated from the cabinet.

- 10.) Remove the Phillips screws which attach the logic board to the chassis. Slide the board out to the rear, and disconnect the cable connector.

Disassembly is now complete.

To reassemble the printer once the modifications are done follow these steps in the reverse order.

The actual printer modifications are described below in four steps. The first three steps are performed before reassembling the printer. The last step involves only the interface cable.

Unfortunately, construction of the printer is such that you cannot test to determine whether your modifications are correct until everything is reassembled. So please take your time, and double-check your connections. Fig. 1 shows a schematic diagram of all printer modifica-

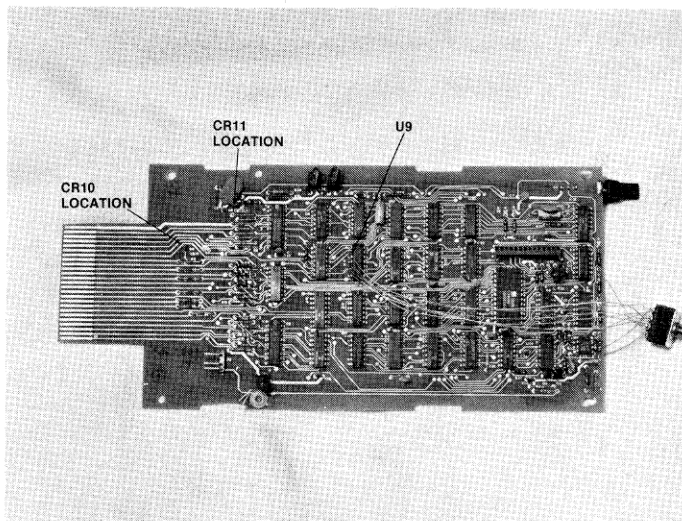


Photo 2. Top of Printer Logic Board. U9 pins 2, 5, and 6 must be cut 1/16-inch below IC body before wiring to switch.

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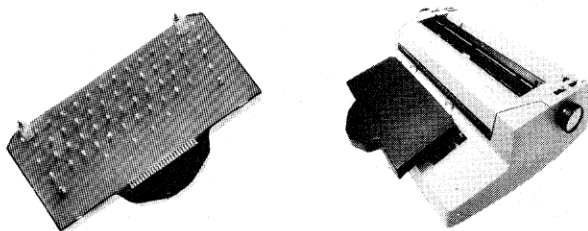
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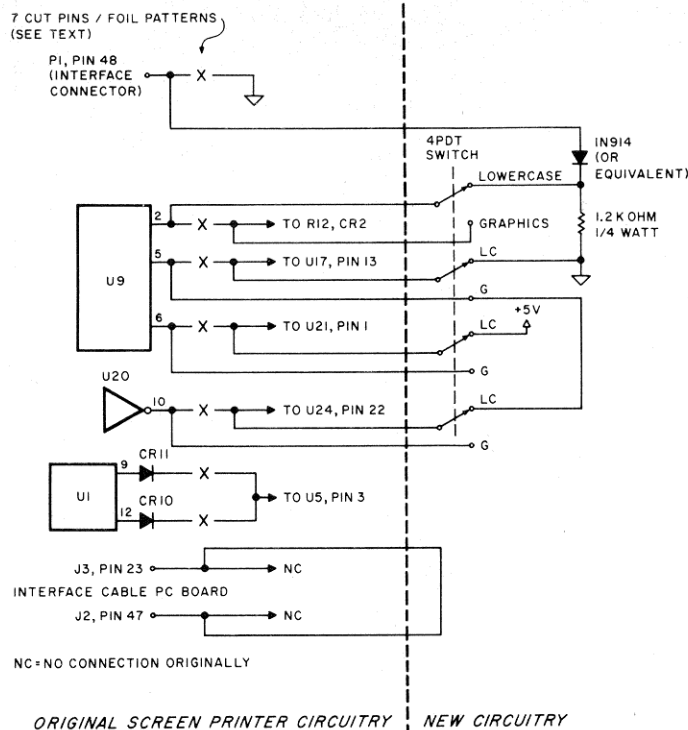


Fig. 1. Screen Printer Modifications

tions.

1.) Using an Xacto knife or small sharp screwdriver cut through the connector pin-48 circuit trace where shown in Photo 1. Using a small diagonal cutter, cut the following IC pins (approximately 1/16 inch below the pins' entrance to the IC body): U9 pins 2, 5, and 6, U20 pin 10. Use Photo 2 as a guide to locate the IC pins. Use a small screwdriver to separate the remaining pin stubs and the circuit board. Cut on end of CR10 and CR11 where shown in Photo 2.

2.) Connect the 1N914 diode and the 1.2 kohm resistor as shown in Photo 1. Now connect the four-pole switch as shown, in Fig. 1, allowing about three inches of wire beyond the front board edge to the switch. This will allow you to insert the switch in the cabinet as the chassis is reinstalled.

3.) Drill a hole in the front of the cabinet to accommodate the additional switch. Reassemble the printer.

4.) Disassemble the printer interface cable circuit board assembly by carefully prying up one end of the plastic cover with a small screwdriver. Using Photo as a guide, solder a short jumper

wire from J3 pin 23 to J2 pin 47. When finished, snap the cover back over the circuit board.

TRS-80 Modifications

The TRS-80 modifications involve two circuit changes. One is the addition of a switchable storage facility (a 2102 RAM) for bit-6 data bus information. The other adds an unused gate in order to disable main RAM output to the data bus during Screen Printer access of video RAM. First, however, disassemble the keyboard assembly.

Gaining access to the TRS-80 logic board is considerably easier than the Screen Printer disassembly. Disconnect all cables and place the keyboard upside-down on a soft towel. Remove the six Phillips screws from the bottom cover. Then turn the keyboard right-side-up. Lift off the top cover. Hinge the keyboard upward, away from the logic board, to a vertical position. While holding the keyboard with one hand, remove the five rubber spacers from the plastic posts.

Cut the circuit trace connecting Z73 pins 9 and 12 shown in Photo 4. Set the keyboard down lightly onto the logic board.

Now carefully lift both the keyboard and logic board out of

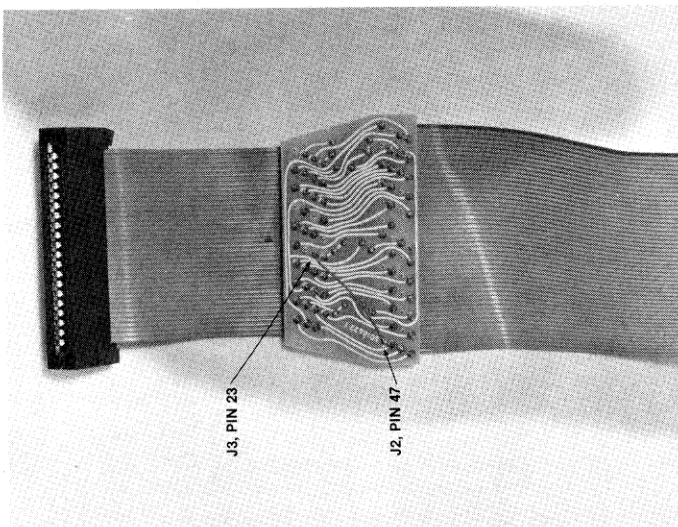


Photo 3. Printer Interface Cable PC Board. Install single jumper wire as shown.

the cabinet bottom as an assembly. Avoiding any bending of the logic board. Turn the two boards upside-down on the towel, using great care to avoid stress on the short interconnecting ribbon cable.

All of the remaining modification work involves the component side of the logic board.

It's best to use both the schematic in Fig.2 and Photo 5 to avoid confusion.

To install the lowercase mod, begin by "piggy-backing" the 2102 RAM on top of Z45. Solder all pins of the 2102 to the corresponding pins of Z45 except pins 11 and 12, which should be bent outward as shown in Photo 5.

Next, cut pin 13 of Z30 using the method described in the

Screen Printer mod. Now drill a hole to mount the SPDT toggle switch where desired (I found the space between the tape and video DIN jacks convenient.) To complete the video RAM portion of the mod, connect four wires as shown from Z30, Z44, the new RAM, and the SPDT switch.

To complete the main RAM portion of the mod, cut the trace below Z74 where shown in Photo 5. (This trace was the original connection to the main RAM enable/disable buffers Z67 and Z68.) Finally, connect three wires from Z52, Z73, Z74, and the previously cut circuit trace.

Double-check all of your wiring against Photo 5. When reassembling, don't forget the five rubber spacers to isolate the logic board from the keyboard.

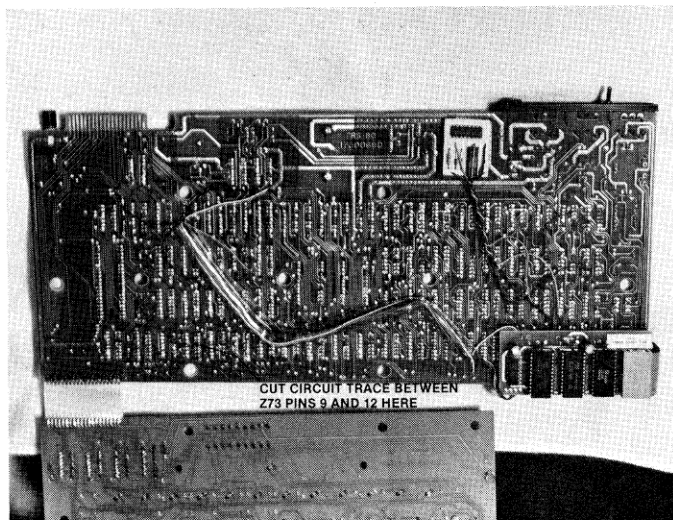


Photo 4. Underside of TRS-80 Logic Board

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|--|---------|---------|------|--------|-------|---------|
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| SET | RESET | POINT | CHRS | RANDOM | RND | POKE |
| DATA | READ | RESTORE | END | GOTO | GOSUB | CLS |
| INPUT | INKEY\$ | LET | STOP | OUT | INP | RETURN |
| PRINT | LPRINT | PRINT@ | USR | SGN | INT | ABS |
| SQR | LEN | ASC | VAL | STR\$ | POS | ON GOTO |
| ON GOSUB | REM | NOT | AND | OR | | |
| INTEGER MATH *MULTIPLY /DIVIDE +ADD -SUBTRACT +/- 32767 | | | | | | |
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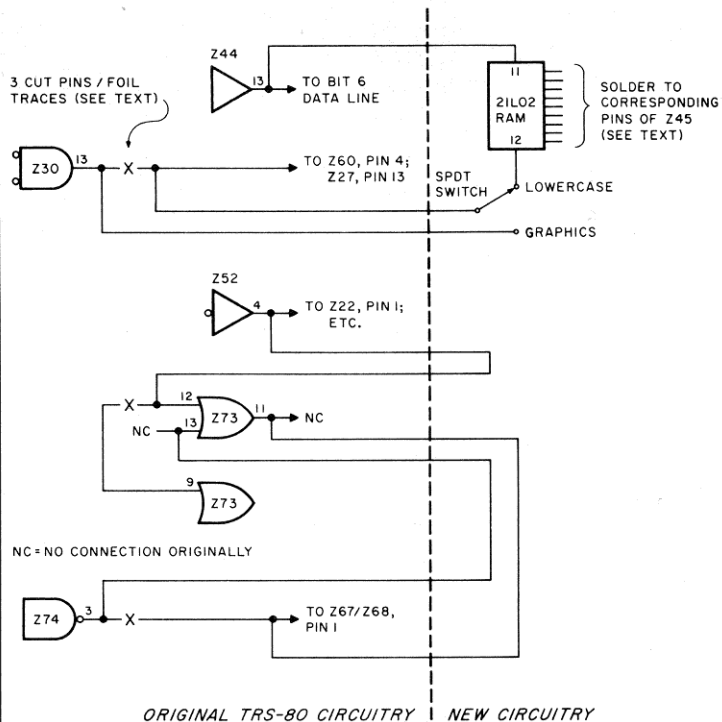
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PROGRAMMING TOOLS FOR YOUR TRS-80™

INSIDE LEVEL II

The Programmers Guide to the TRS-80 ROMS

INSIDE LEVEL II is a comprehensive reference guide to the Level II ROMs which allows the machine language or Basic programmer to easily utilize the sophisticated routines they contain. Concisely explains set-ups, calling sequences, and variable passage for number conversion, arithmetic operations, and mathematical functions, as well as keyboard, tape, and video routines. Part II presents an entirely new composite program structure which loads under the SYSTEM command and executes in both Basic and machine code with the speed and efficiency of a compiler. In addition, the 18 chapters include a large body of other information useful to the programmer including tape formats, RAM usage, relocation of Basic programs, USR call expansion, creating SYSTEM tapes of your own programs, interfacing of Basic variables directly with machine code, a method of greatly increasing the speed at which data elements are stored on tape, and special precautions for disk systems. **INSIDE LEVEL II** is a clearly organized reference manual. It is fully typeset and packed with nothing but useful information. It does not contain questions and answers, ROM dumps, or cartoons.

INSIDE LEVEL II.....\$15.95

SINGLE STEP THROUGH RAM OR ROM

STEP80 allows you to step through any Basic or machine language program one instruction at a time, and see the address, hexadecimal value, Zilog mnemonic, register contents, and step count for each instruction. The top 14 lines of the video screen are left unaltered so that the 'target program' may perform its display functions unobstructed. **STEP80** will follow program flow right into the ROMs, and is an invaluable aid in learning how the ROM routines function. Commands include step (trace), disassemble, run in step mode at variable step rate, display or alter memory or CPU registers, jump to memory location, execute a CALL, set breakpoints in RAM or ROM, write SYSTEM tapes, and relocate to any page in RAM. The display may also be routed to your line printer through the device control block so custom print drivers are automatically supported. **STEP80.....\$16.95**

TELECOMMUNICATIONS PROGRAM

This machine language program allows reliable high speed file transfers between two disk-based computers over modems or direct wire. It is menu driven and extremely simple to use. Functions include real-time terminal mode, save RAM buffer on disk, transmit disk file, receive binary files, examine and modify UART parameters, program 8 custom log-on messages, automatic 16-bit checksum verification of accurate transmission and reception, and many more user conveniences. Supports line printers and lowercase characters. With this program you will no longer need to convert machine language programs to ASCII for transmission, and you will know immediately if the transmission was accurate. **TELCOM.....\$29.95**

PROGRAM INDEX FOR DISK BASIC

Assemble an alphabetized index of your entire program library from disk directories. Program names and free space are read automatically (need not be typed in) and may be alphabetized with a fast Shell/Metzner sort by disk or program. The list may also be searched for any disk, program, or extension; disks or programs added or deleted; and the whole list or any part sent to the printer. Finally, the list itself may be stored on disk for future access and update. 'The best thing since sliced bread' (January issue of '80 Microcomputing). Works with TRSDOS, NEWDOS, and NEWDOS/80. One drive and 32K required. **INDEX.....\$19.95**

4 SPEED OPTIONS FOR YOUR TRS-80

The SK-2 clock modification allows CPU speeds to be switched between normal, an increase of 50%, or a 50% reduction; selectable at any time without interrupting execution or crashing the program. Instructions are also given for a 100% increase to 3.54 MHz, though the TRS-80 is not reliable at this speed. The SK-2 may be configured by the user to change speed with a toggle switch or on software command. It will automatically return to normal speed any time a disk is active, requires no change to the operating system, and has provisions for adding an LED to indicate when the computer is not at normal speed. It mounts inside the keyboard unit with only 4 necessary connections for the switch option (switch not included), and is easily removed if the computer ever needs service. The SK-2 comes fully assembled with socketed IC's and illustrated instructions. **SK-2.....\$24.95**

INSTANT ASSEMBLER

The **INSTANT ASSEMBLER** is a new, powerful tape-based editor/assembler and debugger for the TRS-80 Model I. It features immediate detection of errors as the source code is entered, assembly to memory as well as to tape, a built-in single-stepping debugger, a compactly coded source format that uses 1/3 as much memory as standard source, the ability to produce relocatable code modules, and the ability to link-load independently written modules. In addition, the **INSTANT ASSEMBLER** has many operational features including single stroke entry of DEFB and DEFW, continuous editing of successive lines, alphabetic listing of symbol table, separate commands for listing error lines or the symbol table, block move function, and verification of source tapes.

INSTANT ASSEMBLER includes three separate programs. The assembler itself includes the single-stepper and debugger. In this mode you may have full-register displays, decimal or hex entry, forward or backward memory displays, disassembly of object code in memory, memory display in ASCII format, and hex-to-decimal or decimal-to-hex conversion. The single-stepper will step one instruction at a time or at a fast rate to any defined address. During assembly you may quickly switch from assembler to debugger and back again without losing the source code. This makes **INSTANT ASSEMBLER** an excellent learning tool for machine language programming. Also included on the tape are two versions of the linking loader which allow you to write your programs in smaller modules and link them together for final assembly.

INSTANT ASSEMBLER occupies 8375 bytes of memory. In a 16K machine this will leave you more than 7000 bytes which is enough to write assembly language programs of around 2000 bytes. This makes it ideal for users with only 16K machines. While this version was written specifically for tape systems, we will soon have a disk version as well. The instruction manual may be purchased separately for \$5, which will apply towards the purchase of the **INSTANT ASSEMBLER**. **INTASM.....\$29.95**

RAM SPOOLER AND PRINT FORMATTER

This program is a full feature print formatting package featuring user definable line and page length (with line feeds inserted between words or after punctuation), screen dump, printer pause control, and baud rate selection. In addition, printing is done from a 4K expandable buffer area so that the LPRINT or LLIST command returns control to the user while printing is being done. Ideal for Selectric or other slow printers. Allows printing and processing to run concurrently. Output may be directed to either the parallel port, serial port, or the video screen. **SPOOLER.....\$16.95**

MACHINE CODE FAST FOURIER TRANSFORM

This complete package includes 3 versions of the machine language FFTASM routine assembled for 16, 32, and 48K machines, a short sample Basic program to access them, a 10K Basic program which includes sophisticated interactive graphing and data manipulation, and a manual of instructions and examples. The machine language subroutines use variables defined by a supporting Basic program to make data entry and retrieval extremely fast and easy for custom implementation. They perform 20 to 40 times faster than their Basic equivalent (256 points in 12.5 seconds), and require less than 1550 bytes of memory. The FFT is useful in analyzing stock market and commodity trends as well as for scientific information. **FFTASM.....\$49.95**

DUPLICATE SYSTEM TAPES WITH CLONE

Make duplicate copies of any tape written for Level II. They may be SYSTEM tapes or data lists. The file name, load address, entry point, and every byte (in ASCII format) are displayed on the video screen. **CLONE.....\$16.95**

RAMTEST FOR LEVEL II

This machine language program is a very thorough test for several types of RAM errors. A complete test of each individual bit in a 48K machine takes just 14 seconds. Includes a separate test for power line glitches. **RAMTEST.....\$9.95**

EDIT BASIC PROGRAMS WITH ELECTRIC PENCIL

Load Basic programs or any other ASCII data file into the disk version of Electric Pencil for editing. One command from DOS quickly modifies existing files to Pencil format. One disk and 32K required. **PENPATCH.....\$9.95**

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UTILITIES

TRS-80 UTILITY I—Give your program that professional look. RENUM: Renumber any Level II program to make room for modification or to clean up the listing. DUPLIK: With this program you can duplicate any BASIC, assembly/machine language program, verify the data and record the program to tape. You can even record Level I programs on a Level II keyboard. (T1) Order No. 0081R \$9.95.

TRS-80 UTILITY II—Change the drudgery of editing your programs into a quick, easy job. It includes: ●CFETCH: You'll be able to merge consecutively numbered BASIC programs into one program. It will also search through any Level II program tape and display the file names for all programs. ●CWRITE: Combine subroutines that work in different memory locations into one program. It works with BASIC and/or machine-language programs and will give you a general checksum to verify that your program hasn't dropped any bits. (T1) Order No. 0076R \$9.95.

THE COMMUNICATOR—This package lets you transmit data over the telephone lines. The full ORIGINATE/ANSWER capability allows your TRS-80 to be controlled from a remote-based terminal, or allows two TRS-80s to "talk" to each other. You can transmit data or programs from home base to a remote terminal. There will be a simultaneous display of information on both video monitors. Requires a modem and RS-232 interface for each terminal. (T1) Order No. 0126R \$9.95.

TERMINAL-80—Communicate with the rest of the world! These programs give you control of the RS-232 port of your Expansion Interface. You can connect one or

more serial terminals to your TRS-80 and it will accept input from the RS-232 interface just as if it were entered from the keyboard. Your TRS-80 can also be transformed into a dumb terminal, for use in a time-sharing situation to talk with "big" computers via a modem. The LPRINT/LLIST commands will transfer a program to a receiving computer. Supports upper/lowercase, Level II & III control characters, and all functions such as CHR\$. The baud rate is software controlled for your convenience. Requires an RS-232 interface. (T1) Order No. 0130R \$24.95.

DISK SCOPE—Need to check out the contents of a disk? Then check out these three programs. ●FILELOC: If you know the name of the program or data file, FILELOC will show you which tracks and sectors contain that file, as well as how much memory the file takes when loaded into RAM. You can then print the information, search for a new file or exit to BASIC. ●CDISK: This utility and test program allows you to view any track and sector on your disks in ASCII, Hex and screen POKES. It disregards all protection codes. ●PASSWORD: This machine-language program not only gives you a password for individual files, but for whole disks as well. (T2) Order No. 0139R \$19.95.

DISK EDITOR—This machine-language program gives you total access to ANY byte of information in ANY sector in ANY track of your disk! You can examine, alter, add and delete information with ease. You can even search for a specific string (up to 8 characters long). If you need hardcopy, use the LPRINT command to send a copy of the video display to your printer. It can be used with TRSDOS, NEWDOS and MicroDOS. Both the 35 and 40 track versions are included. (T2) Order No. 0180RD \$39.95.

BPA (BASIC PROGRAMMING ASSISTANT)—BPA does three things for you: (1) It will list the variables used in a BASIC program. Optionally, it will list the line numbers where each variable appears; the variable-type symbol (string, integer, single or double precision); whether it is dimensioned and where it is changed. (2) It will produce a cross-referenced list of line numbers for GOTO's, GOSUB's and IF... THEN statements. (3) It will list the line numbers where a selected BASIC function word (e.g., INPUT, PRINT) is used. (T1) Order No. 0203R \$14.95.

TLDIS & DLDIS—These two utilities are ideal for those who wish to decipher and/or modify machine-code programs. TLDIS (Tape-based Labeling Disassembler) and DLDIS (Disk-based Labeling Disassembler) are three-pass, label-assigning disassemblers that assign labels (where appropriate) to the routines in a machine-language program. Their output is almost identical to that of a hand-assembled source code. TLDIS can send the disassembly to cassette tape, DLDIS can send it to disk; both send it to the video monitor. Each version can be reassembled using Tandy's EDTASM or Apparat's disk extension of EDTASM, respectively. You can also send either disassembly to a printer (R/S parallel port). Because of the labels, it is a simple matter to change any object code program by disassembling it and making changes to the resulting source code, without losing track of the jumpload addresses. Labels start at "AA00" and increment up, in even

numbered steps (AA02, AA04, etc.). The odd numbers (AA01, AA03, etc.) are left for your (optional) use in the reassembly. **TLDIS (T1) Order No. 0230R \$14.95. DLDIS (T2) Order No. 0231RD \$19.95. Model III compatible**

THE DISASSEMBLER—This is a single-pass, hex-notation that sends its output either to tape or to a lineprinter (R/S parallel port). The tape output is directly compatible with Tandy's EDTASM, so you can disassemble an object code tape and output it to tape, then use EDTASM to add, delete, change and re-assemble your new version. It displays the displacement and absolute address of any relative jumps made by the disassembled program. It also displays and ASCII characters used in an LD or CP opcode. It is relocatable and you can jump to memory locations and transfer control between Disassembler and other utility programs. (T1) Order No. 0232R \$9.95.

COMPRESSION UTILITY PACK—Do you want to add sound routines to a Space Trek program that already uses 16K? Or maybe you need an extra column in that financial report program, but when you run it, you get OM errors?

With a wave of your hand, and a little help from either of the COMPRESSION programs, in this package, your problems are over.

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16K RAM
- (T2)=TRS-80 Model I Level II,
16K RAM with Expansion
Interface 16 + K RAM and
one disk drive
- (T3)=TRS-80 Model II, 32K RAM

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COMPU-CAROLS—We are proud to present a selection of Christmas carols, played by your TRS-80. Just place an AM radio next to your keyboard and you'll be amazed at the quality of this computer-generated music. You'll hear AWAY IN A MANGER, NOEL, SILENT NIGHT, O LITTLE TOWN OF BETHLEHEM and eight more of your favorite carols. (T1) Order No. 0036R \$9.95.

DOODLES AND DISPLAYS II—It includes: ● **DOODLE PAD**: Draw pictures and save them on cassette tapes. ● **SYMMETRICS**: An electronic kaleidoscope that's constantly changing. ● **DRAWING**: Like DOODLE PAD, but for the serious artist. Over 40 user commands. ● **RANDOM PATTERN DISPLAY**: The computer does the drawing, but those with itchy fingers can make alterations. ● **MATHCURVES**: Bring those geometry lessons to life. Six different geometrical curves on the screen of your TRS-80. ● **RUGPATTERNS**: Designs rug patterns with a choice of user or computer control. (T1) Order No. 0042R \$7.95.

MUSIC MASTER—Includes these four audio treats: ● **MICRO-ORGAN**: This program changes your computer into a musical instrument, with a range of four octaves with three voices! You can play sharps and flats to imitate the sounds of an organ, harpsichord or piano. ● **KALEIDOPY**: Now you can have a computerized "player piano." Generate a symmetrical graphics pattern and then see it transformed into music. ● **COMPOSER**: Experiment with computer-generated music. You can select the length of the piece, its scale, and its tempo. ● **KEYMANIA**: Test your memory and your musical ear. One to four players try to repeat the melody that the computer creates. (T1) Order No. 0084R \$9.95. Model III compatible

ELECTRONICS

HAM PACKAGE I—This versatile package lets you solve many of the problems commonly encountered in electronics design, including: ● **BASIC ELECTRONICS WITH VOLTAGE DIVIDER**: Solve problems involving Ohm's Law, voltage dividers and RC time constants. ● **DIPOLAR AND YAGI ANTENNAS**: Design antennas easily, without tedious calculations. (T1) Order No. 0007R \$7.95. Model III compatible

ELECTRONICS I—This package will not only calculate component values for you, it will also draw a schematic diagram. Included are: ● **TUNED CIRCUITS AND COIL WINDING**: Design tuned circuits without resorting to cumbersome tables and calculations. ● **555 TIMER CIRCUITS**: Design astable or monostable timing circuits using this popular IC. ● **LM-381 PREAMP DESIGN**: Design IC preamps with this low-noise IC audio amp. (T1) Order No. 0008R \$7.95. Model III compatible

QSL MANAGER—Ever looked at your log book and wondered if you sent a QSL card to the operator you worked last week? Maybe you sent a QSL but can't remember getting one in return. The QSL MANAGER will help you set up a computerized log book that gives you instant access to your records. Make complete log entries which include: Date, Time, Call sign, Name, Band, both the sent and received Signal Reports, the Mode, whether a QSL card was sent or received and any remarks you want to add. The QSL MANAGER program has built-in editing features that let you keep your log book up to date. (T2) Order No. 0151RD \$19.95. Model III compatible

HOME EDUCATION

MONEY MADNESS—You can experience the Raw Power of High Finance with two Big Money empires. ● **MILLIONAIRES**: Can you manipulate \$1000 into a million dollars in fifteen years? It all depends on your strategy as you buy and sell properties, negotiate bank loans, collect rentals and accept sealed bids. ● **TIMBER BARON**: An in-depth experience of the timber business, from the time you cut the trees until your milled lumber reaches the market. These transactions are affected by those tough, unexpected eventualities that can upset the most careful plans. (T1) Order No. 0156R \$9.95. Model III compatible

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TEACHER—This program enables you to create your own tests, quizzes and exercises for the education of your children. You can even provide "graphic" reward for your children and provide hints for problem solving. (T1) Order No. 0065R \$9.95. Model III compatible

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ARCHIMEDES' APPRENTICE—This two-part package will teach you the formulas used to find the volume of any solid object including parallelopipeds (cubes and rectangular solids), prisms, pyramids, cylinders, cones and spheres. It will show you on-screen diagrams of these figures, and present you with the formulas you'll need to compute their volumes. (T1) Order No. 0092R \$9.95. Model III compatible

TYPING TEACHER—This complete seven-part package takes you from initial familiarization with the keys, through typing words and phrases, to complete mastery of the keyboard. Your computer can even become a bottomless page for typing practice. (T1) Order No. 0099R \$9.95. Model III compatible

VIDEO SPEED READING TRAINER—Most people's reading speed is limited simply because they read individual letters or words. Now you can increase your reading speed and comprehension by reading whole words and phrases. This package will train your mind to quickly recognize numbers, words, letters and phrases. Start at any speed level at which you are comfortable and the computer will automatically advance you as your reading speed and comprehension increases. (T1) Order No. 0100R \$9.95. Model III compatible

WORDWATCH—four different programs to entertain and educate. ● **WORD RACE**—race to the finish line of defining words correctly. ● **HIDE N SPELL**—find the misspelled word, then correct it. ● **SPELLING TUTOR**—a spelling lesson, but beware, the spelling may become unusual. There you have it, Wordplay x four = WORDWATCH. (T1) Order No. 0111R \$7.95. Model III compatible

MIND WARP—This game includes: ● **MIND TWIST**: A Mastermind-type game with a twist. Try to guess the computer's secret digit sequence. ● **MIND BENDER**: A multi-level game where you must discover the computer's secret code. It's no mystery, the MIND WARP package is for puzzle lovers everywhere. (T1) Order No. 0118R \$9.95. Model III compatible

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IQ TEST—IQ TEST will administer and score an intelligence test in just 30 minutes. There are three equivalent tests, each consisting of 3 questions that survey your general knowledge and problem solving abilities. (T1) Order No. 0157R \$9.95.

SPECIAL BUSINESS

BOWLING LEAGUE SECRETARY—This package is simple to operate and provides a dynamic reference to all the names of individual bowlers, their team numbers, scores, team names, league data and all necessary statistics. The system is highly adaptable, with 17 different scoring options that allow you to custom tailor the program to suit your league's special needs. And, if you even have any problems, simply type HELP and the program will give you an explanation of what information is needed—complete with a sample entry. The system puts at your fingertips all individual weekly scores, team cumulative scores, bowler cumulative scores and individual leaders in the following categories: high single, high series, high average and high points. (T2) Order No. 0095RD \$49.95. Model III compatible

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BEGINNER'S RUSSIAN—In order to understand a foreign culture, you must know its language. The three programs in this package will give you on-screen displays of the characters of the Cyrillic alphabet, detailed instructions of their proper pronunciation and exercises that will have you recognizing and speaking simple Russian words. An excellent package for students, businessmen, scientists or anyone who is interested in learning the Russian language. (T1) Order No. 0136R \$9.95. Model III compatible

BOWLING LEAGUE STATISTICS SYSTEM—Keeps a computerized list of league data, team data and data for each bowler. Extremely flexible, it has a total of 16 different options to let you modify the program to suit your league's rules. It is easy to use and has a built-in "HELP" feature to aid you. (T1) Order No. 0056R \$24.95.

HOME/PERSONAL

HOUSEHOLD ACCOUNTANT—Save with these two programs: ● **BUDGET & EXPENSE ANALYSIS**: It has nine sections for income and expenses and an option for quarterly/yearly reviews. ● **LIFE INSURANCE COST COMPARISON**: Compare the total costs of various insurance policies. Contrast term with whole life. It will store and display up to six prospective policies. (T1) Order No. 0069 \$7.95. Model III compatible

PERSONAL BILL PAYING—You can keep a computerized list of ALL your bills (up to 22 accounts), each listed with its name, number, due date and amount owed. Individual accounts can be displayed with a month-by-month breakdown of payments (including check numbers) and current accounts can be separated from inactive ones. It allows you to save the data to tape for future use. (T1) Order No. 0103R \$7.95. Model III compatible

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CHESSMATE-80—This versatile chess opponent gives you a choice of ten levels of play, from the "blitz" level (the computer has 3 seconds to move) to the infinity level (where the computer will consider every possible move—which could take years). This machine-language program is a conservative player and follows all the rules of international play. **CHESSMATE-80** can teach you how to move and allow you to set up the board and play end games or special problems. **CHESSMATE-80** battled Sargon II to a draw at two minutes a move and beat Microchess 1.5 in six moves. (T1) Order No. 0057R \$19.95. Model III compatible

YOUR CRIBBAGE AND CHECKERS PARTNER—CRIBBAGE is a two-person game that you are sure to enjoy. This is NOT a tutorial—it is a game worthy adversary. **CHECKERS**: An old favorite which follows international rules, including multiple jumps. (T1) Order No. 0068R \$9.95. Model III compatible

CARDS—A one-player package to let you play, with your computer, these famous games: ● **DRAW AND STUD POKER**: These programs will keep your game sharp; ● **NO-TRUMP BRIDGE**: Develop your strategy and (hopefully) increase your skill. (T1) Order No. 0063R \$7.95. Model III compatible

FLIGHT SIMULATIONS

RAMROM PATROL/TIE FIGHTER/KLINGON CAPTURE—● **RAMROM PATROL**: Destroy the RamRom ships before they capture you. ● **TIE FIGHTER**: Wipe out the enemy Tie fighters and become a hero of the Rebellion. ● **KLINGON CAPTURE**: You must capture the Klingon ship intact. (T1) Order No. 0028R \$7.95. Model III compatible

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FLIGHT PATH—This three-part package includes: ● **MOUNTAIN PILOT**: Become a daring bush pilot and fly supplies to a remote mining camp. You must cross mountain ranges and struggle with headwinds, tricky navigation and rapidly diminishing fuel. ● **O'HARE**: A control tower simulation for you would-be Air Traffic Controllers. You are responsible for the lives of hundreds of passengers as you guide aircraft through your control sector. ● **PRECISION APPROACH RADAR**: Combines the skills of pilot and Air Traffic Controller, as your commands guide an aircraft in its approach to the field and a safe landing. (T1) Order No. 0171R \$9.95. Model III compatible

BALL TURRET GUNNER—Imagine yourself at the control console of a strategic laser weapon, deep in the space lanes. Your hindsight detector informs you of a Gnat fighter coming in for an attack so you swivel your laser turret until you can see the target. Watch the Range Indicator and your Targeting Computer's readout closely, because you'll only have a fraction of a second to catch him in your sights. Will you transform the Gnat into a ball of ionized gas or will you see that blinding flash that means The Big Demotion? **BALL TURRET GUNNER**, with your choice of multiple levels of difficulty, optional sound effects and excellent graphics, is more than a game. It's an event to be savored. (T1) Order No. 0051R \$9.95. Model III compatible

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Disk owners, your speed mods, aren't over once the hardware is done. Your DOS software needs help too.

Fast Clock DOS

Allan J. Domuret
7825 Willowcrest Way
Fair Oaks, CA 95628

A number of TRS-80 CPU clock modification kits are currently being advertised. Most of them speed up the CPU clock from the standard 1.77 MHz to a rate 50 percent faster at 2.66 MHz. A more recent development to 3.54 MHz doubles the standard TRS-80 CPU clock speed, bringing the rate to 3.54 MHz.

At these speeds, several advantages are obtained: faster program running time and faster sorts. Even the Electric Pencil works better—the frustrating character dropout on a word-wrap-around virtually disappears.

The main problem, up until now, has been that disk operations at fast clock rates were virtually impossible. Excessive disk errors required that the CPU clock be slowed down to its standard 1.77 MHz rate in order to reliably read and write. Not being convinced the problem was insoluble, I sought a way to make disk I/O reliable at fast clock speeds, and I found it.

A Word of Caution

I am sharing the info with

TRS-80 owners with a word of caution and one request: This is a relatively new area of TRS-80 operations and some problems may develop. If anyone who makes the speedup mod encounters problems, please contact me so that some efforts can be made to correct them.

If you install the clock speedup board and encounter problems, it is quite easy to restore the TRS-80 to its original configuration. Most TRS-80's, however, should work quite well at the 2.66 MHz clock. The 3.54 MHz clock might be a little more flaky. These problems result from the varied quality of the CPU chip.

My clock speedup kit was purchased from Archbold Electronics, Sacramento, CA. They provide a kit that can be wired to run a TRS-80 at either 2.66 or 3.54 MHz. The 3.54 MHz speedup uses the same kit, but involves the additional small task of cutting two traces and running two jumpers on the main CPU board.

My system has been running reliably at 3.54 MHz for several months now. Note that some users have had problems with the 3.54 MHz clock mod and they therefore had to be satisfied with the 2.66 MHz clock.

If you plan on making the

hardware changes required for the speedup mod, keep in mind the effect it may have on getting maintenance or warranty service on your TRS-80 by Radio Shack.

Theory of Operation

After plowing through the Radio Shack Disk Operating System (TRSDOS), it became apparent that processing time delays were required. They involve some kind of "settling time" for certain parts of the hardware or software. The method uses PUSH-POPs in pairs, which do nothing but create time delays.

Using RSM2D, or a similar machine language system monitor, an example of one of these time delays can be found in NEWDOS at memory location 45F3 hex as a series of PUSH-POP commands. Another POP-PUSH (in that order) time delay is found at 4698 hex, but this particular delay is also functional in that it loads the BC register with data.

For DOS 2.2 and 2.3 users, the memory locations for the SYSO/SYS PUSH-POPs are 4664 hex and 4697 hex.

There is also a time wasting series of PUSH-POPs in the BOOT/SYS file, but these will not normally be found in mem-

ory. The reason is that the BOOT is resident only briefly during a boot up or a reset. It loads initially to memory location 4200 hex, and after it has served its purpose it is overwritten by SYSO/SYS. If you know how to load the BOOT/SYS (it is at drive zero, track zero, sector zero) to 4200 hex with RSM2D, you will see the PUSH-POPs at 42BB and 42C9 hex. The BOOT/SYS PUSH-POPs are the same for DOS 2.2, 2.3 and NEWDOS.

There are additional PUSH-POPs in several of the other DOS files, plus some timing loops in the FORMAT/CMD file of all three DOS systems.

To enable disk operations with a fast running TRS-80, it is only necessary to increase the time delays by substituting doing nothing commands to kill additional time. It so happens that the E3 machine code for "EX (SP), HL" can serve our purpose by being used in pairs. A pair of E3 commands uses up about three times as much time as a two-byte PUSH-POP. With the E3 command, data in (SP) is exchanged with HL either two times or four times—the end result being nothing but wasted time.

But the additional time delay, required at memory location 4698 hex in NEWDOS and 4697

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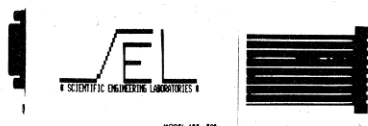
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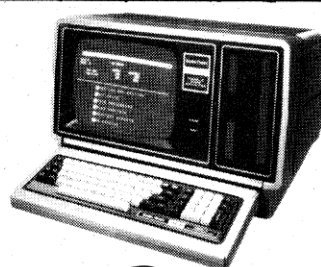
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hex in DOS 2.2, will not fit within the DOS SYSD/SYS code itself. It is necessary to branch out of SYSD/SYS with a JUMP to a place in memory where the required time delay can be programmed, and then return to SYSD/SYS.

There is a safe "hole" in disk memory at 4060 hex. Memory in this area is used only by Debug, so any software commands loaded to this area are usually safe. The required time delay can sit safely there without ever getting clobbered, unless you call up Debug. Normally this should create no problems be-

cause you won't be performing disk operations with Debug anyway. Just remember that when you are finished with Debug, perform a RESET, and everything will reboot back to a normal configuration.

Enter SUPERZAP

The disk modifications are made directly to disk using Aparat's Superzap. If you are not familiar with Superzap, be absolutely certain that you make a backup disk before performing surgery. Even you pros should work on a backup. If you blow it on a backup, it will crash, but no other harm will be inflicted on

your system. Just start over again.

DOS ZAPS

The DOS ZAPS provided here will enable a modified TRS-80 to run at a fast clock rate of 2.66 or 3.54 MHz (or even 4.0 MHz if you are technically inclined) and to function normally for all disk operations. Disk files created at any clock rate will be compatible, so that those created on a 3.54 MHz system can be loaded and run on a 1.77 or 2.66 MHz system, etc.

In the ZAPS given in Table 1, the six digit prefix on each new line is Superzap's identifier code, assuming only drive zero is available.

Additional Considerations

If you are using anything which depends on a controlled baud rate other than the Radio Shack RS-232 board—for example, the Small Systems Software TRS232 cassette port printer driver—you may encounter timing problems. The Radio Shack RS-232 board, however, has its own clock generator that is not affected by the modified clock in the CPU.

I am running a Heath H-14 RS-232 serial printer on the Radio Shack RS-232 board and it was not necessary for me to change any baud rate settings when I went to the fast clock mod. I am also running a modem without any problems.

Printer operations are normal if a handshake is used, as is the case with just about any printer connected to the Centronics parallel port.

One possible problem might be a TRS-80 equipped with cheap memory chips. Most, but possibly not all, memory chips should work well with the 2.66 MHz clock. So far, I have not encountered any problems of this type. Also, for what it is worth, my system does not have a buffered cable and it works fine.

A Pencil Patch

When running the TRS-80 at the 2.66 MHz clock rate, you will find that the Pencil's cursor fades irritably in and out (probably because its blink rate is

close to a multiple of the vertical sweep rate of the video monitor). The problem disappears at the 3.54 MHz clock rate, but the user may nevertheless prefer to slow down the cursor blink rate. Step by step instructions for this modification follow.

1. With NEWDOS, call up LM-OFFSET and use it to load the Electric Pencil to memory location 6589 hex (Pencil's normal memory residence starts at 5589 hex, but it will not LOAD there because it is too low in memory).

2. Answer N to the SUPPRESS APPENDAGE? prompt.

3. Answer Y to the DISABLE INTERRUPTS? prompt.

4. Write this relocated Pencil file to disk. (This relocated version of Pencil will load to start, end, and execute addresses of 6589, 7CA4, and 7C95 hex. LM-OFFSET will display these addresses for you.)

5. Return to DOS.

6. Load, but do not run, the newly created Pencil file to memory.

7. Using RSM2D or your other favorite monitor, look at memory locations 6CE4 and 6CEE. These should read:

F PENCIL2/CMD 6589 7CA4 7C95

The values 0096 and 012C loaded into DE affect the cursor blink rate.

8. To change the cursor blink rate, change memory locations 6CE5 from 96 to E1, and 6CEF from 2C to C2 (Yes, two 'see' to 'see' two). This increases each of the time values loaded into DE by 50 percent to correspond to the clock speedup of 50 percent. The first change will 'LD 00E1' into DE and the second will 'LD 01C2' into DE.

9. Now press RESET while holding down SHIFT/up arrow to reenter DOS. Holding down the SHIFT/up arrow disables the keyboard debounce.

10. SAVE Pencil to disk with TAPEDISK from your old TRS-DOS 2.2 or 2.3 disk. The appendage attached to Pencil by LM-OFFSET will relocate the program to its normal operating position every time it is loaded from disk. The TAPEDISK com-

Table 1

BOOT (for NEWDOS, DOS 2.2 and DOS 2.3):

- 0000BB (Superzap's column identifier)—change F5 F1 F5 F1 to E3 E3 E3 E3.
- 0000C9—change C5 C1 to E3 E3.

SYSD/SYS (NEWDOS only):

- 0008A9—change to read C3 A2 46 E3 E3 E3 E3 3A EC etc.
- 000952—change C3 E3 45 to read C3 60 40
- 001759—following 2E 0D 03, where 02 02 00 4E begins, change 02 02 etc., to read, 01 09 60 40 E3 E3 E3 E3 C3 E3 45 02 02 00 4E
- 011403 (repair system directory—change from 5D to 68)

SYSD/SYS (DOS 2.2 only):

- 00075F—change F5 F1 00 00 to E3 E3 E3 E3
 - 000792—change C1 C5 C1 C5 F3 to C1 C5 C3 60 40
 - 001721—change 02 02 00 4E to 01 0A 60 40 E3 E3 E3 E3 F3 C3 9C 46 02 02 00 4E
- (No system directory repair is needed for TRSDOS.)

SYSD/SYS (DOS 2.3 only): Apply the change for 00075F and 000792 as shown above for DOS 2.2. For the last change at 001721, the location is 00172D for DOS 2.3. The change code is otherwise identical. This is the only difference required in changes between DOS 2.2 and DOS 2.3.

FORMAT (for NEWDOS, DOS 2.2 and DOS 2.3—all are identical):

- 00227D—change 01 CD 00 to 01 9A 01
- 002290—change 01 9D 19 to 01 3A 33
- 0022A7—change 01 BA 00 to 01 74 01
- 0022BE—change 01 20 17 to 01 40 33
- 0023D5—change F5 F1 F5 F1 to E3 E3 E3 E3
- 0023F4—change C5 C1 C5 C1 to E3 E3 E3 E3
- 0025B6—change F5 F1 F5 F1 to E3 E3 E3 E3
- 0025C7—change C5 C1 C5 C1 to E3 E3 E3 E3
- 00316F—change F5 F1 F5 F1 to E3 E3 E3 E3
- 00317D—change C5 C1 to E3 E3

SYS3/SYS (NEWDOS):

- 012354—change 21 EF 37 to CD 85 51
- 012448—change 02 02 4F 50 etc., to E3 E3 E3 E3 21 EF 37 C9 02 02 4F 50
- 0123B9—change 01 8D to 01 95
- 011703—change directory end of file from 4C to 54

SYS3/SYS (DOS 2.2 and 2.3):

- No changes

BACKUP/CMD (DOS 2.2 and 2.3):

- 003757—change 01 CD 00 to 01 9A 01
- 00376A—change 01 9D 19 to 01 3A 33
- 003780—change 01 BA 00 to 01 74 01
- 003794—change 01 20 17 to 01 40 33
- 003855—change F5 F1 F5 F1 to E3 E3 E3 E3
- 003874—change C5 C1 C5 C1 to E3 E3 E3 E3
- 004131—change F5 F1 F5 F1 to E3 E3 E3 E3
- 00413E—change C5 C1 C5 C1 to E3 E3 E3 E3
- 004185—change F5 F1 F5 F1 to E3 E3 E3 E3
- 0042BB—change F5 F1 F5 F1 to E3 E3 E3 E3
- 0042CC—change C5 C1 C5 C1 to E3 E3 E3 E3



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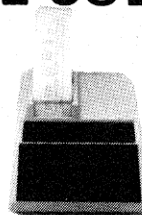


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mand for writing Pencil to disk is:

6CE4: 11 96 00 LD DE,0096
6CEE: 11 2C 01 LD DE,012C

These addresses represent the start, end and execute addresses. Of course you can use a different file name if desired, and a drive number can also be specified.

That's it. Try your Pencil now with the TRS-80 running with the fast clock. If desired, the blink rate can be changed by changing values loaded into the DE register, following the same procedure described above.

One final note: There are a few different versions of NEW-DOS. If you have difficulty finding the disk bytes to be modified according to the directions provided here, feel free to contact me for help.

New Developments

Since this article was accepted for publication, Archbold

Electronics has released a new version of their speedup board which guarantees a 50 percent minimum increase in CPU clock action. Instructions are also provided for clock speed increases in excess of 125 percent (4.0 MHz or more), but no guarantees are made for this substantial change. Nevertheless, with the hardware improvements provided in the new board, most TRS-80 disk or tape systems can actually run reliably at 4.0 MHz or even 5.3 MHz.

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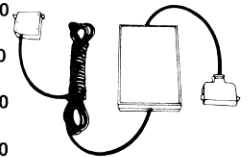
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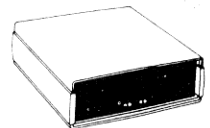
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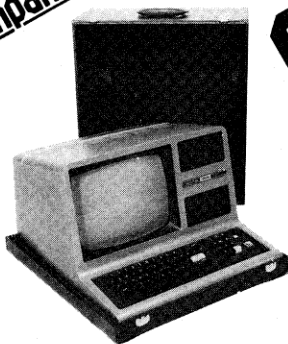


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Loops and Arrays

L. Mitchell Wein, CPA
470 Midland Ave.
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Loops and arrays, when used together, can be the most powerful tool available to the BASIC programmer. They can represent tables of information, cash receipts and disbursement journals, general ledgers, game maps and complex equations; the possible uses are limited only by the creativity and imagination of the programmer.

A loop is a functioning circle in which events repeat themselves until a certain condition is met, breaking that circle. The Level II BASIC used in the TRS-80 provides the FOR-NEXT statement to construct the circle and the IF...THEN...ELSE statement to break it.

Sequence of Variables

An array is an indexed sequence of variables which can be presented as a list (one dimension), a table (two dimensions) or a location in a matrix (three or more dimensions). An array can be defined for string variables as well as numeric variables. The key instruction used

to set up arrays is the DIM instruction. One must be careful to always use the DIM instruction after the CLEAR and DEF instructions to prevent canceling the DIM instruction. An array can be dimensioned only once while a program is running, so it is best to dimension arrays early in a program, preferably by using multiple statements in the same line. To satisfy the same requirement, loops should stay clear of DIM statements. A sample DIM line follows:

```
20 DIM PY(50), AC(50), DC(50)
```

This same line could also be represented as:

```
20 DIM AC(50,3)
```

Also:

```
20 INPUT "MAXIMUM NUMBER OF  
ROWS = ";MX  
30 DIM AC(MX,3)
```

The last method is the best since the user can dimension the array afresh each time the program is run. However, an ON ERROR GOTO...RESUME should be inserted before the INPUT. This routine will hold the program intact if you should exceed your 80's memory.

The key to utilizing arrays

from input to output to display is the loop. I have designed a simple General Ledger to demonstrate the function and desirability of combining loops and arrays in a program.

Our General Ledger requires a minimum of two files; the first is a Balance Forward Accounting (BFA) file, and the second is a Transaction file. The BFA file

contains the account number, the account alpha description and its latest balance. This information is provided for every account in the file, with debits represented by positive balances and credits represented by negative balances. The sum of all the balances should equal zero, if the file is in balance.

The Transaction file contains

| | |
|---------------------------|----------------------------|
| 20 PRINT HEADER | 330 N% = ACCOUNT |
| 30 INITIALIZE VARIABLES | NUMBER |
| 40 DISPLAY MENU | 340 O# = OPENING |
| 50 INPUT ACCOUNT NAMES | BALANCE FOR PERIOD |
| AND NUMBERS FROM | 350 D# = DEBITS FOR |
| KEYBOARD | PERIOD |
| 60 INPUT TRANSACTIONS | 360 C# = CREDITS FOR |
| FROM TAPE | PERIOD |
| 70 INPUT TRANSACTIONS | 370 E# = ENDING BALANCE |
| FROM WAFER | FOR PERIOD |
| 80 INPUT TRANSACTIONS | 1000 SUBROUTINE LOCATIONS: |
| FROM DISK | 1010 23000 CLR SCREEN |
| 90 OUTPUT TRANSACTIONS | AND CENTER CURSOR |
| TO TAPE | LARGE PRINT |
| 100 OUTPUT TRANSACTIONS | 1020 23300 CLR SCREEN |
| TO WAFER | AND CENTER CURSOR |
| 110 OUTPUT TRANSACTIONS | SMALL PRINT |
| TO DISK | 1030 23500 TURN PAGE— |
| 120 DISPLAY BALANCE SHEET | LARGE PRINT |
| SUMMARY | 1040 23700 TURN PAGE— |
| 130 DISPLAY NET INCOME | SMALL PRINT |
| SUMMARY | 1050 24000 CALCULATE |
| 140 DISPLAY PERSONAL | ENDING BALANCE FOR |
| EXPENSE SUMMARY | PERIOD |
| 150 DISPLAY SINGLE OR | 1060 24300 PAGE HEADER |
| MULTIPLE ACCOUNTS | FOR BALANCE SHEET |
| 160 RE-SORT ACCOUNTS | 1070 24700 PAGE HEADER |
| 300 VARIABLE DEFINITIONS: | FOR NET INCOME |
| 310 M% = MAXIMUM | 1080 25000 PAGE HEADER |
| NUMBER OF ACCOUNTS | FOR PERSONAL |
| 320 A\$(M) = ACCOUNT NAME | EXPENSE |

Program Listing 1.

the following information for each entry: date of entry, transaction number, account number and amount of entry. The sum of all entries with a particular transaction number should always equal zero (debits should equal credits).

A daily Transaction file is entered from the keyboard, and the files are used to update the monthly or annual Transaction and BFA files. These files can be maintained on tape, wafer, or disk, and can be accessed using the video monitor or the printer. The BFA file for our General Ledger could be split into asset and liability accounts, net income accounts and personal expense accounts. You could also include a budget for the net income accounts and the personal expense accounts.

Program Listing 1 presents the logic statements for the BFA file.

We're now ready to explore briefly how loops and arrays are used in our program's execution. First, let's look at how some of the variables are initialized in Program Listing 2.

By using DEF in line 3000 we eliminate the need for continuous punctuation as we write the program. Now comes the most important part of the whole program:

```
3000 DIM A$(M), N(M), E(M,3)
```

In this case E(M,0) is the opening balance; E(M,1) is the sum of

the debits; E(M,2) is the sum of the credits; and E(M,3) is the ending balance. Alternatively, one could use the DIM statement, 3030 DIM A\$(M), N(M), O(M), D(M), C(M), E(M), which generates the ending balance in the following manner:

```
23999 END
24000 E(M) = O(M) + D(M) - C(M)
24010 RETURN
```

It's only necessary to store the opening balance in the BFA files when using this method. The debits and credits will enter the CPU (central processing unit) from the transaction files and generate the ending balance, which will become the new opening balance in the next period.

The Table of Accounts

Program Listing 3 displays a table of accounts.

Line 15040 displays the account name. Lines 15050 through 15090 display the account name as an integer, and the opening balance, debits, credits, and the ending balance, using double precision defined by F\$.

The loop is defined by lines 15010 and 15110. Lines 15020 and 15100 temporarily halt printing on the screen after 12 lines. (Four lines are allowed for a header and trailer on the screen.) Line 15030 terminates the display when the array is exhausted. ■

```
3000 CLEAR 1000: DEFSTR A: DEFINT M, N: DEFDBL O, D, C, E: F$ = "#####.##"
3010 GOSUB 23000: PRINT "ENTER MAXIMUM": PRINT "NUMBER OF"
3020 INPUT "ACCOUNTS": M
```

Program Listing 2.

```
15000 GOSUB 24300
15010 FOR X = 1 TO M
15020 LN = LN + 1
15030 IF N%(M) = 0 THEN 15200
15040 GOSUB 24000: PRINT A$(M)
15050 PRINT N%(M);
15060 PRINT TAB(12);: PRINT USING F$; O#(M)
15070 PRINT TAB(24);: PRINT USING F$; D#(M)
15080 PRINT TAB(36);: PRINT USING F$; C#(M)
15090 PRINT TAB(48);: PRINT USING F$; E#(M)
15100 IF LN = 12 THEN GOSUB 23700: GOSUB 24300
15110 NEXT X
15200 GOSUB 23700: PRINT CHR$(23);: GOTO 4000
```

Program Listing 3.

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Red Letter Day For Lowercase

*George C. Ferber
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Important days in the calendar year are printed in red. July 4, 1980 was one of those days.

Preparing to make modifications to my microcomputer system around that time, I ordered kits from vendors around the country, including a lowercase printer modification for my Radio Shack 779 printer, an additional and final 16K of RAM for the Model I expansion interface, a Pencil lowercase mod kit, and the Patch, a character generator modifier allowing conventional typing methods and lowercase display.

The printer modification kit cost \$125. I ordered the Pencil lowercase mod and the 16K RAM kit including Verbatim diskettes and labels. The RAM kit costs \$75, the lowercase mod, \$19. I ordered the \$59.95 Patch from Ceddat.

I was concerned about the different features offered by the two lowercase mods for the processor. The Pencil mod requires shifting for lowercase, instead

of the more familiar shift for uppercase on typewriters. The kit's control key facilitates Pencil's use and the upper-lowercase switch permits maintenance of the integrity of Level II BASIC. The switch to lowercase is made prior to entering Pencil. This mod requires a short modifier program to implement the lowercase conversion.

The Patch lowercase mod promises normal typing methods as in shift for uppercase, and a block cursor. The question of Pencil compatibility elicits the response "a control key is required."

I installed the printer modification prior to July 4. I decided to use only the control key of the Pencil mod and was awaiting arrival of the Patch.

Printer Mod

The printer kit contains three items. There is a small circuit board with one attached lead terminating in a red sub-miniature E-Z clip connector, requiring no soldering. Just press the spring loaded button, a tiny hook emerges. Hook it around the exposed leg (pin) of the integrated circuit indicated on the drawing, and the connection is

complete. The second item is a jumper wire with black E-Z clips installed at each end, and third, the instructions.

The two pages of instructions are legible and well-organized. Each page contains a clear drawing of the printer's large circuit board with the components that are involved in the modification outlined, as well as enough other components to serve as guideposts to orient the installer.

Four brief numbered lines of instructions provide the appropriate order to pursue the modification. Each instruction is concise, clear, and easy to follow. A review of the four quickly reveals the general nature of the modification. A 28-pin dual in-line package (DIP) integrated circuit must be removed, without damaging the chip or bending its pins. The kit's circuit board plugs into the vacated socket and its connecting wire and jumper wire clip in place.

Electronic enclosure disassembly and reassembly frequently require more time than the modifications. Fine interconnecting wires and delicate components require careful handling and positioning during

physical movement. This prevents shorting, breakage, etc. Occasionally fasteners, knobs, and supports become stubborn and pose problems during reassembly.

The large circuit board, where the modifications occur, is accessed from the rear of the printer.

I first removed the fanfold paper from the tractors and pushed the box aside. Next I unplugged the power cord. Then I separated the data cable connector and laid it aside. A small knob had to be removed from the print density control on the lower right hand side. The wire rack paper guide and its ground wire came off next. The ground wire terminal with its associated static charge collector required the use of a screwdriver, and the paper guide merely lifted off. It was held in place by predrilled holes in the printer housing.

Two screws retained an L-shaped rear cover. Their removal permitted the cover to be withdrawn and exposed the printer's large main circuit board indicated in the instructions.

I was intimidated by thoughts of breaking the 28-pin DIP or mangling its pins upon prying it

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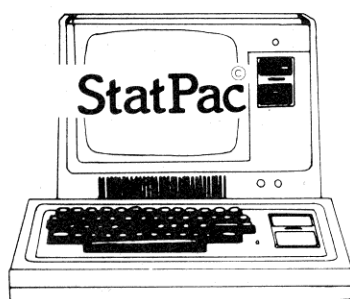
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out of its socket. It lay in the upper left hand corner of the board with little separation from the housing. There was not enough space to grasp each end of the device with a finger. I also visualized an errant pin or two, of the 28 on the replacement board, upon substituting it for the removed integrated circuit.

By gently prying up alternate ends with a small thin-bladed screwdriver inserted between the body of the chip and its socket, I lifted it free. I made repeated lifts at alternate ends moving the chip only slightly each time.

The 28 pins on the bottom of the replacement board are obscured by the board. It is difficult to see if they are entering the socket correctly. By carefully positioning the board over the socket and gently wiggling it, I felt the pins enter the socket's clips and a gentle but firm downward pressure seated the board in the socket.

I could not visually determine whether any pins had been displaced in the process so I decided to continue with the modification and determine its soundness using a dynamic test. I clipped the red E-Z connector to the pin of the integrated circuit indicated on the drawing, and then installed the jumper. All that remained was reassembly and testing.

I was eager to observe the lowercase g, j, q, y, and z's appearance in print. My processor had not yet been modified, so I LPRINTed, from BASIC's command mode, the lowercase set using ASCII code numbers and the CHR\$() statement. CHR\$(97) returns the lowercase a and CHR\$(122) returns the z.

As anticipated, they appeared without descenders. As desirable as descenders are, this modification's lowercase character forms are generally pleasing to the eye.

The Patch

Receiving the Patch July 3, I looked forward to the holiday that would include its installation.

The kit consists of the following: Patch, a small hybrid board with an edge connector, a

short five-conductor flat ribbon cable with attached receptacle, a modified 2102 integrated circuit having two pins bent up (and fine wire leads presoldered to the pins), and a short length of solder.

The ribbon cable's receptacle contains a section of circuit board with conducting traces that serve as a key. The hybrid board has an edge card type connector designed to receive the ribbon cable's receptacle and connect it to various points on the processor board. The hybrid board plugs into the processor board's unused ROM socket.

Although legible, the drawings accompanying the instructions should be improved. A lack of page numbering results in needless paper thumbing. I would like to prod Cecdat into some improvements here. However, a detailed step-by-step in-

I used two rechargeable battery-powered pencil irons designed for this type of work. If the first iron's charge is depleted before all soldering is complete, I have the second iron as a backup, allowing immediate completion of the work.

An examination, with the aid of a magnifier, revealed no solder shorts or misplaced wire terminations. I closed the case, positioned the keyboard, attached the buffered ribbon cable's edgeboard connector, reconnected the DIN connectors of Radio Shack's refresh fix cable, and inserted the DIN connectors of the power cable, the monitor cable, and the cassette cable. The next step was testing.

Powering up in NEWDOS, I pressed the keys B, A, S, I, and C. The letters appeared in lowercase on the display. I was shocked by the appearance of the letter a. It was misplaced,

s, v, w, x and z are miniature duplicates of their uppercase.

The printer's lowercase c, g, o, p, s, v, w, x and z are also miniature duplicates of their uppercase counterparts.

The printer's lowercase a, g, p, q, and y are all printed low in the matrix form, without descenders, and look much better in print than on display.

I loaded a BASIC module. Would it perform? The code ran as anticipated, loading memory with three diskfile indices, and displayed the module's option table. I selected an option and the code requested a left margin value for a printer function, or a 99 to skip the printout and continue. Upon entering the 99, instead of branching to the appropriate code, DOS READY appeared. This, of course, was a bug introduced by the conversion.

I conducted a test to determine if Pencil would function properly with Patch and the added control key. The code loaded correctly, accepted my yes to the case question, and homed the cursor, prepared to receive text.

The keyboard functioned as expected, shifting for uppercase, and all went well until I attempted to enter a control character. Pressing the control key moved the cursor down one line and subsequent pressing displayed the character. The control function did not execute properly. I suspected, due to an ambiguity in the Pencil's control key instructions, one of the control key's wires should have been soldered to pin 10 of Z2 instead of pin 4.

After a phone conversation with Cecdat, I made the wiring change and Pencil sprang to life.

Memory Expansion

With an inflated ego and devilish grin, I accosted my expansion interface. The final 16K of memory addition would make 48K of memory available to me. I would have all the memory that the 8-bit Z80 could address.

My order specified the kit for the interface since it was the third and final 16K permitted. The 48K system owner would in-

*"The tiny spaces separating
adjacent pins require
a measure of dexterity. . . ."*

stallation guide is provided. These steps include disassembly of the keyboard enclosure, installing the Patch, soldering the five ribbon cable conductors, piggybacking the 2102, terminating its two leads, cutting the trace, and reassembly.

While my keyboard case was open, I installed the control key from the Pencil lowercase kit, leaving its 2102 chip unused. This required boring a 1/4-inch hole just below the left shift key and soldering the two fine pre-attached wire leads to pin 10 of Z2 and pin 10 of Z4.

The major portion of all soldering activity involved the soldering of fragile wire leads or piggybacking integrated circuit pins upon resident integrated circuit pins.

The tiny spaces separating adjacent pins require a measure of dexterity, steady hands, and an appropriate soldering iron.

being too high in the character set matrix form. The system asked WHAT? and continued in the DOS READY mode. I retyped the five letters in uppercase and upon pressing the enter key, Disk BASIC loaded into memory.

Eager to observe the display's form of the g, j, p, q, y, and z and the printer's form of the same letters plus the a, I entered, on a single line, each lowercase letter, separated by a space. The a, g, p, q, and y stuck out. I suspected the too high position of the a might be due to a character generator error, since there was no reason why it couldn't be lower in the matrix form.

Obviously the g, p, q, and y could not be lowered since they occupy the full height of the available form. Lowering them would exceed the lower limit of this form.

The display's lowercase c, o,

stall his first 16K memory addition in the keyboard enclosure, the second and third addition in the interface.

The kit contains a set of eight RAM chips, two sockets with shorting bars, and four pages of instructions. Two of the pages are for the Apple and two for the TRS-80. The eight integrated circuits are packed with their pins inserted in a small rectangle of black conductive foam. This protects their sensitive PN junctions from potential damage from discharges of static electricity that can occur during handling and installation.

Each page of the TRS-80 instructions is a photo copy and

indicates different versions of the interface circuit board. Both are almost illegible except for the typed lines of instruction.

All cables must be removed, and the interface enclosure withdrawn from beneath the monitor and placed upside down with the front facing you, on a static-free work surface. Six screws and the bottom are removed revealing the heavily populated circuit board.

There were only eight vacant sockets left on my board, Z1 thru Z8, and all that remained was to ground my hand, remove each chip from the protective foam, and gently insert it in one of the available sockets.

Each chip must be installed with its notch or dot in the same direction, which is toward the nearest edge, and imitates the orientation of the previous 16K memory addition already in place in Z9 thru Z16.

The two remaining devices evidently were for the Apple conversion. All that remained was closing up and repositioning the expansion interface in my system.

Loading NEWDOS 2.1, I entered Disk BASIC. From the command mode, I entered PRINT MEM. The command returned 38,659. At this writing, I have not had time to thoroughly investigate the operational fea-

tures of my new capability. I have noticed one irregularity.

When the LIBRARY of DOS commands is displayed by the command LIB, all command names are displayed in uppercase, except COPY. It is displayed as cOPY with the first and last letter in lowercase and the two middle letters in uppercase.

Should you decide to make similar modifications to your system, keep the aspirin bottle handy for the first few hours of proofreading the display. The odd-shaped lowercase letters make it difficult to detect typographical errors, and headaches tend to develop. ■

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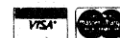
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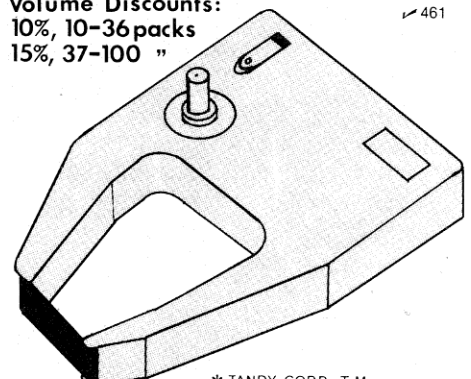
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WHERZIT—A Keyword Indexing and Retrieval Program

James H. Fox
14601 55th St. So.
Afton, MN 55001

Several articles have been written in the last year or so about using home computers to index everything from recipes to record collections to magazine articles. All have dealt with a specific technique or minor variations such as storing the title in a string array and then searching all titles for a desired character string. Such a method is usually unsatisfactory for magazine articles or other literature files.

Confusing Titles

Title searches assume that information about the subject matter is contained in the title string. For magazine articles, this is not always true. The author or editor often tries to use a catchy phrase in order to attract your interest and it might not describe the subject. While this is acceptable in fiction markets, it might be out of place in a technical publication where the reader is trying to find and use technical information.

For example, an article titled "WHAZIT?" appeared in the March, 1980, issue of *80*. Was the article about a game? A utility program? Some strange new peripheral? Even knowing that it

was a utility program to identify unlabeled cassettes, you will never find it in a title search.

An alternative is needed when the searching is to be done automatically by machine.

Keys to Indexing

In the early 1960s, a number of sources developed the idea of key concepts as indexing and retrieval mechanisms. The technique is known by various synonyms, commonly, *keyword indexing*, *concept coordination* and *key concept retrieval*. Whatever name is used for an application, the same basic method is used.

When an article is first read or scanned, the reader notes the subject matter and thinks of a few words to describe the contents. The keywords then provide a basis for indexing the article for later recall. For example, the article title "WHAZIT?" might be described by the following keywords: utility, cassette, identification, machine language, POKE.

Note that the keywords do not necessarily appear in the title of the article. The assignment of specific keywords to an article is the first step in indexing.

The second step is filing the article and its associated keywords. Keyword files can be maintained on index cards, in notebooks—or in a computer.

Keys to Retrieval

Assume that you have a series of articles, each of which

is filed and has an associated list of keywords. How do you retrieve the article you want?

Make a list of keywords that describe the subject of interest. Then go to your keyword file and see which magazine articles are described by your chosen keywords.

Each keyword will usually apply to several articles. If you have chosen your keywords consistently, one of the articles referenced by our selected set will be the one you want.

Possible keyword assignments for the March, 1980 issue of *80 Microcomputing* are given in Example 1. If you search this list for articles having the keyword *program*, you will find 13 entries. Each of these matches is called a "hit."

Difficulties

The search may not yield a unique result. However, if you are looking for information on a specific topic, you will find all the information on that topic indexed in your file. Paying careful attention to keyword selection and application will ensure that all hits from a search include related subject matter.

Synonymous terms can cause problems. A simple term like *disk drive* can be the same as *floppy disk* or just *disk*. You

could assign *interfacing* as a keyword but not score a hit if you specify *interface* during the retrieval search. This is especially troublesome when machine searching is based on a specific character string.

One way to avoid synonym difficulties is to maintain a checklist or thesaurus of the actual terms you use as keywords. An example of a keyword thesaurus for microcomputer magazines is given in Example 2.

I still come across occasional articles which require new keywords. This will be especially true in a field as dynamic as microcomputers. Whenever I need a new keyword, I just assign it to the article and then add it to my list.

A final difficulty is word arrangement or syntax. Best illustrated by example, the keywords *wire-wrap*, *interface* and *board* might be applied to different concepts. There might be an article on constructing an interface board using wire-wrap techniques. Another might describe interfacing with wire-wrapped boards. Both articles would register a hit during a retrieval search.

File

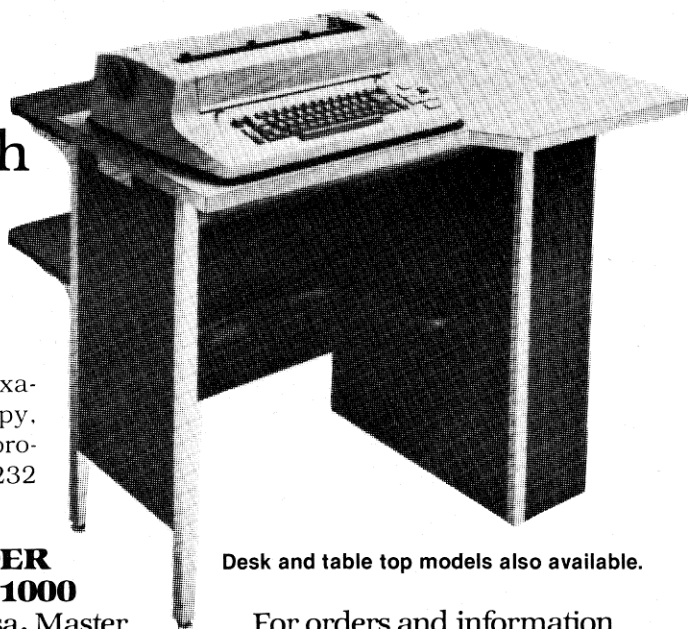
A file is a collection of rec-

| KEY 1 | KEY 2 | KEY 3 | KEY 4 | TITLE | M | D | P |
|-------|-------|-------|-------|-------|---|---|---|
| | | | | | | | |

Figure 1. Record definition as described in the article. M is magazine code; D is date; P is page number.

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APPLICATION,FINANCE,ANALYSIS,SOFTWARE,INVESTMENT ANAL,80,0380,28
TAXES,PROGRAM,APPLICATION,SOFTWARE,IRS-80,80,0380,42
PROGRAM,ASSEMBLER,SERIAL,PRINTER,SPOOL AND DESPOOL,80,0380,46
GAME,ARTIFICIAL,PROGRAM,SOFTWARE,4K INTELLIGENCE,80,0380,55
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HARDWARE,CONSTRUCTION,INTERFACE,I/O,A HOMEBREW,80,0380,96
SOFTWARE,PRINTER,DRIVER,PROGRAM,LPRINT ROUTINES,80,0380,105
HARDWARE,CONSTRUCTION,POWER-SUPPLY,MODIFICATION,REGULATE IT,80,0380,113
PROGRAM,ASSEMBLER,APPLICATION,TAPE,WHAZIT,80,0380,115
APPLICATION,PROGRAM,GRAPHICS,THEORY,BIORHYTHMS,80,0380,117
HARDWARE,I/O,INTERFACE,CONSTRUCTION,I/O PORTS PLUS,80,0380,120
PROGRAM,ASSEMBLER,DISPLAY,EDITOR,SCREEN EDITOR,80,0380,122
SOFTWARE,THEORY,TECHNIQUE,ERROR,EXTRA ERRORS,80,0380,125
APPLICATION,PROGRAM,SEARCH, ,DUTY ROSTER,80,0380,127
PROGRAM,DISPLAY,GRAPHICS,PLOTTER,GRAPH PLOTTER,80,0380,130
HARDWARE,CONSTRUCTION, , ,BOX IT IN,80,0380,132
REVIEW,SOFTWARE, , ,ONE INTO TWO,80,0380,134
REVIEW,HARDWARE,SERIAL,INTERFACE,RS-232,80,0380,136
APPLICATION,PROGRAM,THEORY,TECHNIQUE,SOUNDEX CODES,80,0380,138

```

Example 1. Typical data entry lines for the May, 1980 issue of 80 Microcomputing. The keywords are in the first four data fields.

ords. Each record has specified fields that contain information. An analogy can be made with a common filing cabinet in which each drawer is called a file. Each folder in the drawer is called a record and each paper in the folder is called a field.

In order to be machine compatible, our files, records and fields must be strictly defined. For keyword indexing, I defined a record with eight fields. A typical record is illustrated in Fig. 1.

The first four fields are ten characters long. These fields contain the keywords for the record. Four keywords should be adequate for retrieval of records in a magazine article index. Ten characters are sufficient to allow keywords to be defined clearly.

The remaining fields identify the location of the article. Field five contains up to 14 characters of the title, permitting identification in a table of contents. Field six is a two-character code indicating magazine name. Field seven contains the issue data in a four-character string. Field eight is a three-character string with the article's page number.

Although I found a 63-character record definition convenient, you may decide to expand or re-

duce it. In that case you will have to make appropriate

changes in the programs listed here.

| | | | |
|-----------------|---------------|--------------------|----------------|
| A/D-D/A | EDITOR | MATH | SOL |
| ALGORITHM | EDUCATION | MEMORY | SORT |
| ANALYSIS | ERROR | MEMORY-MAP | SPEECH |
| APL | EXAMPLE | MODELLING | STANDARD |
| APPLE | | MODIFICATI(ON) | STRUCTURED |
| APPLICATIO(N) | FICTION | MONITOR | (PROGRAMMING) |
| APPROXIMAT(ION) | FILE | MORSE-CODE | SWTP |
| ARTIFICIAL | FINANCE | MULTIPROGR(AMMING) | S-100 |
| (INTELLIGENCE) | FLOATING | MUSIC | |
| ASCII | FLOPPY | | TAPE |
| ASSEMBLER | F8 | NAVIGATION | TAXES |
| | | NETWORK | TECHNIQUE |
| BAR-CODE | GAMES | NUMBER | TERMINAL |
| BASIC | GRAPHICS | | TESTING |
| BAUDOT | | OPTIMIZATI(ON) | TEXT-EDITI(NG) |
| BOARD | HAM-RADIO | OSI | THEORY |
| BUSINESS | HARDWARE | | TI |
| | HASH | PAPER-TAPE | TRS-80 |
| CALCULATOR | HEATH | PARALLEL | TTL |
| CASSETTE | HISTORY | PASCAL | TV |
| CHESS | | PAGE | |
| CLOCK | INTERFACE | PERIPHERAL | VIDEO |
| CLUBS | INTERFACIN(G) | PET | |
| COBOL | INTERPRETE(R) | PLOTTER | WIRE-WRAP |
| COLOR | INTERRUPT | POWER-SUPP(LY) | |
| COMMUNICAT(ION) | I/O | PRINTER | Z-80 |
| COMPILER | | PROGRAM | |
| CONSTRUCTI(ON) | JOYSTICK | PROM | 6502 |
| CONTROL | | PROTOCOL | 6800 |
| CONTROLLER | KEYBOARD | | 8008 |
| CONVERSION | KIM | REVIEW | 8080 |
| COSMAC | KIT | ROBOT | |
| COUNTER | | ROM | |
| | LANGUAGE | RTTY | |
| DATA-BASE | LIGHT-PEN | | |
| DEBUGGING | LOGIC | SEARCH | |
| DISK | LSI-11 | SEQUENTIAL | |
| DISPLAY | | SERIAL | |
| DRIVER | | SIMULATION | |
| | | SOFTWARE | |

Example 2. Keyword Thesaurus for Microcomputer Magazines. Letters in parenthesis exceed the 10-character keyword field and are included in the thesaurus for information purposes only.

The records are maintained in a string array. Three are concatenated before being written to tape for permanent storage, so that tape I/O efficiency is increased. Shorter records allow tighter string packing, up to the 255-byte maximum string size.

By segregating functions into two programs, only one needs to be in memory at a time and memory is saved. Spaces are deleted from the programs, line numbers are kept to two digits, and multiple statements are included in one line where possible.

Data Base Program

Program Listing 1 is the data base manipulation program. The program is written for a 32K machine. For other memory configurations, CLEAR, DIMR\$ and the MX assignment must be changed. CLEAR 11500 and 44000 are used for 16K and 64K machines. The corresponding MX values and R\$ dimensions

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| | | | | | | | | |
|-------|--------|-------|-------|--------|-------|-------|-------|-------|
| PADD | PSUB | PMPY | PDIV | PVAL | PDER | PINT | POLRT | HEP |
| HEPS | LEP | LEPS | GMMMA | BESJ | BESY | BESK | IO | INUE |
| GMADD | GMSUB | GMPRD | GMTRA | SADD | SSUB | SMPY | SDIV | MFUN |
| SIMQ | MINV | EIGEN | MSTR | DGR3 | QTFG | QG2 | QG10 | RK1 |
| RK2 | RKGS | TALLY | BOUND | ABSENT | CORRE | ORDER | MULTI | GDATA |
| AVDAT | AVCAL | MEANQ | AUTO | CROSS | SMO | EXSMO | CHISQ | QTEST |
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| NDR | RTNI | FMFP | SE13 | APLL | APFS | FORIF | FORIT | FFT |

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>C=N J=N CC=H

The above line tells SCRIPMOD to justify text and to backspace the printer upon encountering a Text Character in the document. The Text Character is entered by placing the cursor at the place in text where the control code is to take place and typing on @T. Of course your printer must be capable of backspacing and must use the ASCII code 8 (or H) as the control for backspace. If the code is something different there is no problem as the correct code may always be sent. Any control code your printer is capable of using from 1 to 31 with or without an **ESCAPE** lead in many be sent.

The second control code which is added in the **MENU** command. You press an @M and the screen clears and prompts you to select a drive from 0 through 3 or return to the text. All visible files can be displayed on the screen at this time. When you select to return to the text, the cursor is placed on the exact character it was on when you selected @M.

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Program Listing 1

```

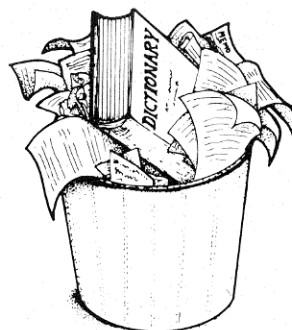
1 CLEAR27000:DEFINT A-Z:DIMR$(420):MX=420:NL=0:ONERRORGOTO2:GOTO4
2 IFERR<>26THENPRINT"ERROR";ERR/2+1;"AT LINE";ERLELSEPRINT"STRING SPACE IS FULL...LAST RECORD DELETED":NL=N-1
3 FORI=1TO5000:NEXT:RESUME4
4 CLS:PRINT@20,"MAGAZINE KEYWORD INDEX":PRINT@84,"DATA BASE MANIPULATION":PRINT@220,"MENU":PRINT@320,"PRESS: 1 TO ENTER NEW RECORDS":PRINT@394,"2 TO UPDATE EXISTING RECORDS"
5 PRINT@458,"3 TO READ DATA TAPE":PRINT@522,"4 TO WRITE DATA TAPE":PRINT@586,"5 TO STOP"
6 QS=INKEY$:IFQS=""THEN6ELSEIFASC(QS)<49ORASC(QS)>53THEN6ELSEQ=VAL(QS):ONOGOTO40,60,30,20,9
7 FORI=1TO4:AS(I)=MID$(R$(N),1+(I-1)*10,10):NEXT:AS(5)=MID$(R$(N),41,14):AS(6)=MID$(R$(N),55,2):AS(7)=MID$(R$(N),57,4):AS(8)=RIGHT$(R$(N),3):RETURN
8 R$(N)="" :FORI=1TO8:R$(N)=R$(N)+AS(I):NEXT:RETURN
9 PRINT@704,"HAS DATA BEEN RECORDED ON TAPE (Y/N)?"
10 QS=INKEY$:IFQS="N"THEN20ELSEIFQS<>"Y"THEN10
11 STOP
12 PRINT@576,"PRESS S TO ABORT DATA I/O AT ANY TIME.":RETURN
20 CLS:PRINT"PREPARE DATA TAPE TO RECORD DATA. PRESS C WHEN READY":I=1
21 IFINKEYS<>"C"THEN21ELSEPRINT@470,"WRITING DATA TAPE":GOSUB12
22 J=1:AS=""
23 AS=AS+R$(I):I=I+1:IFI>NLTHENAS=AS+STRING$(189-LEN(AS),","):GOTO27
24 J=J+1:IFJ=<3THEN25
27 PRINT#-1,AS:IFI>NLTHEN28ELSEIFINKEYS<>"S"THEN24ELSEPRINT"DATA RECORDING ABORTED AFTER";I;"RECORDS.":FORI=1TO5000:NEXT:GOTO4
28 PRINT#-1,"FOXY-1":GOTO4
30 CLS:PRINT"PREPARE DATA TAPE TO PLAY BACK DATA. PRESS C WHEN READY":I=1
31 IFINKEYS<>"C"THEN31ELSEPRINT@470,"READING DATA TAPE":GOSUB12
33 INPUT#-1,AS:IFLEFT$(AS,6)="FOXY-1"THEN35ELSE$(I)=LEFT$(AS,63):R$(I+1)=MID$(AS,64,63):R$(I+2)=MID$(AS,127,63):I=I+2:IFR$(I)=STRING$(63," ")THEN35
34 IFINKEYS<>"S"THENI=I+1:GOTO33:ELSEN=I:PRINT"DATA INPUT ABORTED AFTER";I;"RECORDS.":FORI=1TO5000:NEXT:GOTO4
35 I=I-1:IFR$(I)=STRING$(63," ")THEN35
36 NL=I:GOTO4
40 CLS:PRINT"ENTERING NEW RECORDS":PRINT@128,"FOR EACH RECORD ENTER 4 KEYWORDS,TITLE OF ARTICLE, 2 CHARACTER":PRINT"MAGAZINE CODE, 4 CHARACTER ISSUE DATE AND 3 DIGIT PAGE NUMBER."
41 PRINT"ENTER 'DONE' AND 7 NULLS TO STOP.":PRINT:N=NL
42 INPUT$(1),AS(2),AS(3),AS(4),AS(5),AS(6),AS(7),AS(8):IFAS(1)="DONE"THEN49
43 FORI=1TO4:IFLEN(AS(I))>10THENAS(I)=LEFT$(AS(I),10):NEXT:ELSEAS(I)=AS(I)+STRING$(10-LEN(AS(I))," "):NEXT
44 IFLEN(AS(5))>14THENAS(5)=LEFT$(AS(5),14)ELSEAS(5)=AS(5)+STRING$(14-LEN(AS(5))," ")
45 IFLEN(AS(6))>2THENAS(6)=LEFT$(AS(6),2)ELSEAS(6)=AS(6)+STRING$(2-LEN(AS(6))," ")
46 IF LEN(AS(7))>4THENAS(7)=LEFT$(AS(7),4)ELSEAS(7)=AS(7)+STRING$(4-LEN(AS(7))," ")
47 IFLEN(AS(8))>3THENAS(8)=RIGHT$(AS(8),3)ELSEAS(8)=STRING$(3-LEN(AS(8))," ")AS(8)
48 N=N+1:GOSUB8:IFN<MXTHEN42ELSEPRINT"FILE LIMIT OF 420 RECORDS HAS BEEN REACHED":FORI=1TO5000:NEXT
49 NL=N:GOTO4
60 CLS:PRINT"RECORDS MAY BE UPDATED ONLY BY A SEQUENTIAL SEARCH, BUT YOU":PRINT"CAN SPECIFY THE STARTING POINT AND THE STEP SIZE. THE FILE":PRINT"NOW HOLDS";NL;" RECORDS."
61 INPUT"STARTING POINT";N:IFN<1ORN>NLTHEN61
62 INPUT"STEP SIZE";S
63 GOSUB7
64 PRINT@384,"RECORD";N:PRINT"1 KEY1: ";AS(1)TAB(31)"2 KEY2: ";AS(2)TAB(31)"3 KEY3: ";AS(3)TAB(31)"4 KEY4: ";AS(4)TAB(31)"5 TITLE: ";AS(5)TAB(31)"6 MAGAZINE: ";AS(6)TAB(31)"7 DATE: ";AS(7)TAB(31)"8 PAGE: ";AS(8)
65 PRINT@832,"PRESS THE NUMBER OF THE ITEM TO BE CHANGE D, </> TO DELETE":PRINT"THE ENTIRE RECORD, 9 TO CHANGE THE STEP SIZE, 0 FOR:PRINT"NEXT RECORD (NO CHANGES), SPACE BAR FOR MENU";
66 QS=INKEY$:IFQS=""THEN66ELSEIFQ=" "THEN4ELSEIFASC(QS)<47ORASC(QS)>57THEN66
67 PRINT@832,STRING$(190," "):IFQS<>"0"THEN70ELSEPRINT@832,"DELETE THIS RECORD...HIT C TO CONFIRM, ANY OTHER KEY TO ABORT";
68 QS=INKEY$:IFQS=""THEN68ELSEIFQ<>"C"THEN65
69 NL=NL-1:FORI=1TONL:R$(I)=R$(I+1):NEXT:GOTO63
70 Q=VAL(QS):IFQ=0THEN83ELSEIFQ=9THEN82
71 PRINT@832,"ENTER NEW VALUE FOR ITEM";Q;:INPUTQS:ONQOTO72,72,72,72,72,74,76,78,80
72 IFLEN(QS)>10THENAS(Q)=LEFT$(QS,10)ELSEAS(Q)=QS+STRING$(10-LEN(QS)," ")
73 GOTO81
74 IFLEN(QS)>14THENAS(5)=LEFT$(QS,14)ELSEAS(5)=QS+STRIN

```

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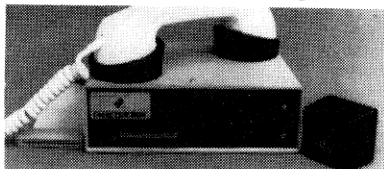
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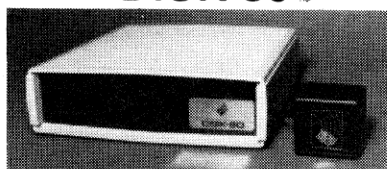
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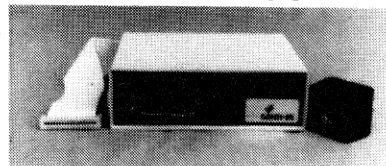
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```

    GS(14-LEN(Q$)," ")
75 GOTO81
76 IFLEN(Q$)>2THENA$(6)=LEFT$(Q$,2)ELSE$(6)=Q$+STRING$(
    (2-LEN(Q$)," ")
77 GOTO81
78 IFLEN(Q$)>4THENA$(7)=LEFT$(Q$,4)ELSE$(7)=Q$+STRING$(
    (4-LEN(Q$)," ")
79 GOTO81
80 IFLEN(Q$)>3THENA$(8)=RIGHT$(Q$,3)ELSE$(8)=STRING$(3
    -LEN(Q$),"")+Q$
81 GOSUB8:GOTO83
82 PRINT@832,"STEP SIZE";:INPUTS

```

are 175 and 675. A menu allows user selection of the desired functions.

Any string can be substituted for FOXY-1 in lines 28 and 33 as long as it is not a keyword in the data file. This string serves as

an end-of-file indicator when the file is transferred between tape and memory.

Since the file records have defined fields, input data maintain field size. This data verification is done in lines 43 to 47. Strings

Program Listing 2

```

1 CLEAR27000:DEFINT A-Z:DIMR$(420):NL=0:MX=420
4 CLS:PRINT@20,"MAGAZINE KEYWORD INDEX":PRINT@88,"DATA
  BASE SEARCH":PRINT@220,"MENU":PRINT@320,"PRESS:
  1 TO READ DATA TAPE":PRINT@394,"2 FOR KEYWORD
  SEARCH"
5 PRINT@458,"3 FOR TITLE LISTING":PRINT@522,"4 TO S
  TOP"
6 Q$=INKEY$:IFQ$=""THEN6ELSEIFASC(Q$)<49ORASC(Q$)>52THE
  N6ELSEQ=VAL(Q$):ONQGOTO30,40,20,10
7 PRINT@960,"(PRESS C TO CONTINUE, M FOR MENU)";
8 Q$=INKEY$:IF Q$="M"THENQ=1ELSEIFQ$="C"THENQ=2ELSE
9 RETURN
10 STOP
11 CLS:PRINT"PRESS S AT ANY TIME TO STOP LISTING":RETUR
  N
12 PRINT@576,"PRESS S TO ABORT DATA INPUT AT ANY TIME":
  RETURN
20 I=1:P$="" % % % % %
21 P=0:GOSUB11:PRINT"ARTICLE TITLE MAGAZINE ISSUE
  PAGE"
22 PRINT USING P$;MID$(R$(I),41,14),MID$(R$(I),55,2),MI
  D$(R$(I),57,4),RIGHT$(R$(I),3):P=P+1:I=I+1:IFINKEY
  $="S"THEN24ELSEIFP<12ANDI<NLTHEN22
23 IFI>NLTHENPRINT@896,"END OF FILE"
24 GOSUB7:IFI>NLTHEN4ELSEONQGOTO4,21
30 CLS:PRINT"PREPARE DATA TAPE TO PLAY BACK DATA. PRESS
  C WHEN READY":I=1
31 IFINKEY$<>"C"THEN3ELSEPRINT@470,"READING DATA TAPE"
  :GOSUB12
33 INPUT#-1,A$:IFLEFT$(A$,6)="FOXY-1"THEN35ELSE$(I)=LE
  FT$(A$,63):R$(I+1)=MID$(A$,64,63):R$(I+2)=MID$(A$,
  127,63):I=I+2:IFR$(I)=STRING$(63," ")THEN35
34 IFINKEY$<>"S"THENI=I+1:GOTO33:ELSEN=L=I:PRINT"DATA IN
  PUT ABORTED AFTER";I;"RECORDS.":FORI=1TO5000:NEXT:
  GOTO4
35 I=I-1:IFR$(I)=STRING$(63," ")THEN35
36 NL=I:GOTO4
40 CLS:PRINT"THE INDEX FILE CAN BE SEARCHED ON THE BASI
  S OF ONE TO FOUR":PRINT"KEYWORDS. A 'HIT' IS SCORE
  D WHENEVER ONE OF THE KEYWORDS IS":PRINT"AN EXACT
  MATCH FOR ONE OF THE KEYS IN THE FILE RECORD."
41 PRINT"FOR EACH HIT A 'VALUE' IS PRINTED ALONG WITH T
  HE TITLE.":PRINT"MAGAZINE,ISSUE AND PAGE. THE NUME
  RICAL VALUE INDICATES THE":PRINT"NUMBER OF KEYWORD
  S WHICH MATCHED KEYS OF THAT RECORD."
42 PRINT@448,"ENTER 4 KEYWORDS FOR SEARCH. IF SEARCH IS
  TO BE BASED ON LESS":PRINT"THAN 4 KEYWORDS, ENTER
  NULLS TO MAKE A TOTAL OF 4 ENTRIES.":INPUTA$(1),A
  $(2),A$(3),A$(4):N=0
43 FORI=1TO4:IFAS(I)<>" "ANDAS(I)<>" "THENN=N+1
44 NEXTI:IFN=0THEN42
45 FORI=1TON:IFLEN(A$(I))>10THENA$(I)=LEFT$(A$(I),10):N
  EXT:ELSEA$(I)=A$(I)+STRING$(10-LEN(A$(I))," "):NEX
  T
46 I=1:P$="" % % % % %
50 P=0:GOSUB11:PRINT"VALUE ARTICLE TITLE MAGA
  ZINE ISSUE PAGE"
51 V=0:FORJ=1TON:FORK=1TO31STEP10:IFAS(J)=MID$(R$(I),K,
  10)THENV=V+1
52 NEXTK:NEXTJ:IFV=0THEN54
53 PRINTUSINGP$;V,MID$(R$(I),41,14),MID$(R$(I),55,2),MI
  D$(R$(I),57,4),RIGHT$(R$(I),3):P=P+1
54 I=I+1:IF INKEY$="S"THEN56ELSEIFP<12ANDI<NLTHEN51
55 IFI>NLTHENPRINT@896,"END OF FILE"
56 GOSUB7:IFI>NLTHEN4ELSEONQGOTO4,50

```

are truncated or spaces added to maintain the field requirements. Similar verification is made in lines 72 to 80 when new data is input to change the records.

Changes are easy to make since the data file is maintained in memory for all operations. Permanent storage of the data is on tape, but the program may be modified to use disk. As with any file of data, it is wise to include a confirmation task before deleting any record. This is done in lines 67 and 68.

Retrieval Programs

The data base can be searched for keywords using several schemes. A simple program is given in Program Listing 2. The program searches the data base for keyword hits. When a hit is found, the article title and other identifying information is output. A hit value is also output. This value corresponds to the number of matches between the keywords of the search and the keywords of the

article. If you have chosen your keywords carefully, articles with high hit values will contain the information you want.

Since Program Listing 2 will output article information even if a single hit is scored, the screen tends to become cluttered. Several other search or printing strategies could avoid this problem. One alternate scheme searches for only one keyword at a time. When a hit is found, the record is added to a list of hits. After each level of searching, only those records which scored hits on all keywords stay in the list. Thus, when a printout is requested, high hit value articles are listed.

The programs listed here show one way that keywords can be applied to magazine indexing. The record structure and searching scheme are ones that work for me. You may want to modify them so that they are tailored to your own needs.

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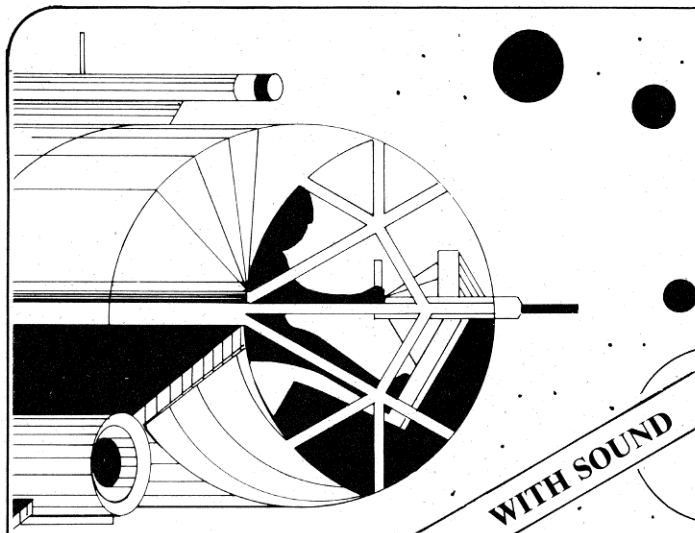
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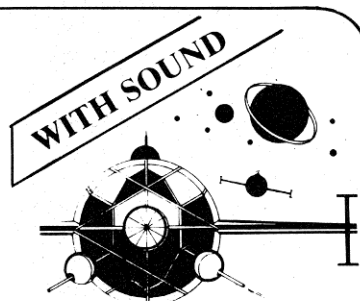
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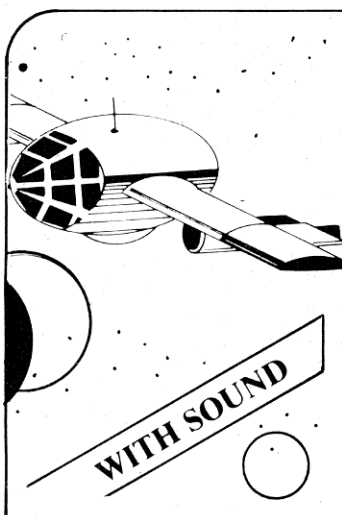
Imagine yourself at the control console of an LW-1417 Stratoblazer (Type B Strategic Laser Weapon). Your Hindsight Director informs you that a Gnat fighter is coming in for an attack. You pivot your gigawatt laser turret until you can see the target on your monitor. The Range Indicator shows him coming in fast. The Targeting Computer studies his course and speed as your finger tenses over the firing key. You know you'll have only a fraction of a second in which to react. The Gnat fighter's evasive maneuvers cause him to dance in your sights. Suddenly,



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The following subroutine will transform your checks into professional works of art—and serve as an effective check protector as well. Although written in Radio Shack Disk BASIC, it can easily be converted to any system. The entire subroutine (lines 300 through 310) occupies only 537 bytes.

Line 110 is included to demonstrate the program. Be careful to correctly insert data line (900) into your main program so that it will be read when called.

The functions in line 100 must be included in the start of your program. Be sure to clear at least 139 bytes. That is the minimum required to run the subroutine. Unless you change the variable M, or add a \$(M\$), you must DEFSTR M. If you keep W as a

variable, and print amounts requiring double precision, you must DEFDBL W.

If you work only with single precision numbers, this is not necessary and will only slow the subroutine.

Line 310 should be modified to fit your particular use. Before I started using a machine language patch to output all slash zeros to the printer as 0, I used subroutine 200 to remove the

slashes. If you don't need it simply delete the line and remove the GOSUB 200 in line 310.

Print the Check

When ready to LPRINT the check, let W equal the amount of the check, and GOSUB 300. The subroutine will then LPRINT the formatted amount with a minimum of 50 characters, filling the spaces with asterisks, which fit my checks perfectly.

If you want more or less length modify the 50 in line 310. Note that line 310 will print at TAB(12), and, after printing, will skip three spaces. You will need to modify this to fit your checks.

It is simple to format amounts in the thousands or even higher, but since you will probably have very few of these to print, and because they'd take so much room, I use a much shorter method of printing any amount equal to or greater than 1000 (See line 300).

These amounts are printed as:

\$\$\$\$ 6835 DOLLARS AND 50 CENTS*****

To test the subroutine, add the following to print test numbers.

```
110 W=RND(2000)/3:IFRND(9)<
    2THENW=W*-1ELSE
    IFRND(9)>8THENW=W*10
120 GOSUB200:GOTO110
```

If, instead of the above test, you prefer to print a few of your actual checks, make them payable to me. When they clear your bank account, you'll know for sure that everything works properly! ■

```
100 CLEAR139:DEFDBLW:DEFSTRM:DIMM(26):FORX=0TO26:READM(
X):NEXT
110 INPUTW:GOSUB200:GOTO110
200 IFINSTR(X$,0)=0THENRETURNELSEMID$(X$,INSTR(X$,"0"),
1)="0":GOTO200
300 IFW<.01THENX$="* VOID * VOID * VOID ":GOTO310ELSEIF
W>=1000THENX$="$$$$"+STR$(INT(W))+ " DOLLARS"+STR$(
INT((W-INT(W))*100+.5001))+ " CENTS":GOTO310
302 Y$=STR$(W+.005001):Y$=MID$(Y$,INSTR(Y$,".")+1,2):IF
LEFT$(Y$,1)="0"THENY$=RIGHT$(Y$,1):IFY$="0"THENY$=
"NO"
304 W=FIX(W):IFW=0THENX$="ONLY "+Y$+" CENTS ":GOTO310EL
SEX$=Y$+" CENTS ":Y$=STR$(W):Y=VAL(RIGHT$(Y$,2)):I
FY=0THENY$="":GOTO306ELSEIFY<21THENY$=M(Y-1)ELSEY$
=M(VAL(MID$(Y$,LEN(Y$)-1,1))+17):IFRIGHT$(STR$(W),
1)<>"0"THENY$=Y$+"-"+M(VAL(RIGHT$(STR$(W),1))-1)
306 X$=Y$+" DOLLARS AND "+X$:IFW<100THEN310
308 Y$=STR$(W):Y=VAL(MID$(Y$,LEN(Y$)-2,1)):X$=M(Y-1)+"
HUNDRED "+X$
310 X$=X$+STRING$(50-LEN(X$),"*"):LPRINTTAB(12)X$:LPRIN
TSTRING$(3,138):RETURN
900 DATAONE,TWO,THREE,FOUR,FIVE,SIX,SEVEN,EIGHT,NINE,TE
N,ELEVEN,TWELVE,THIRTEEN,FOURTEEN,FIFTEEN,SIXTEEN,
SEVENTEEN,EIGHTEEN,NINETEEN,TWENTY,THIRTY,FORTY,FIF
TY,SIXTY,SEVENTY,EIGHTY,NINETY
```

Check Printing Subroutine

Paddle your way around.

TRS-80 Joystick Control

Stephen Barker
7700 Parkway Drive #44
La Mesa, CA 92041

Many games written for the TRS-80 use keyboard input to control game movement. This is done by using the INKEY\$ command. Since I'm not a touch typist, however, I found this to be slow and confusing, especially during an action game.

The need for a joystick was obvious.

I saw ads in computer magazines for joysticks, but none for the TRS-80. Acquiring a joystick was no problem since I also own an Atari Video Computer System that has two. Joysticks are available for purchase independent of the video game.

Operating Principles

The keyboard of the TRS-80 is arranged as an 8×8 matrix. Depressing a key causes a particu-

lar row and column location to be activated during a keyboard scan. Keyboard IC's Z1 and Z2 control the rows, while IC's Z3 and Z4 control the columns. When the three key is pressed, a contact closes inside the key cap. This connects pin six of Z1 to pin six of Z3, thereby inputting a three to the computer. A value of eight is also stored in memory location 16442.

The Atari joystick works on somewhat the same principle as the keyboard. There are five sets of contacts inside it. Four sets control movement up, down, right and left. The fifth is activated by a firing button on the stick. Each set has a common ground, making six wires necessary in order to use all of the functions of the joystick. The five contacts also resemble a 5×1 matrix, with the common ground being the row and the five wires being the columns.

Constructing the Joystick

The Atari joystick comes with a nine-pin female plug, of which six pins are connected. The pins are arranged in two rows with five pins on top and four pins on bottom. Hold the plug so you are

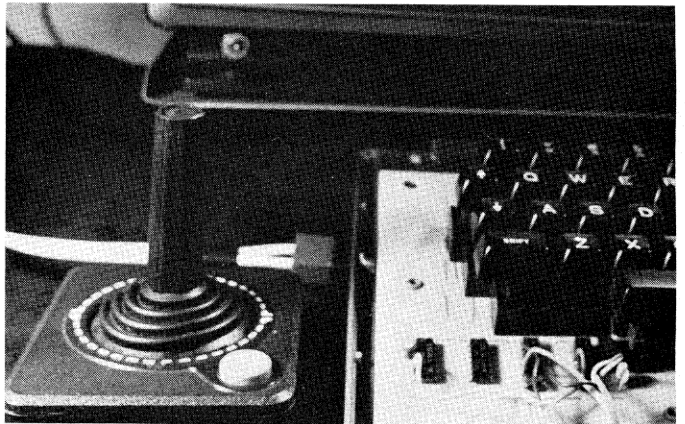


Photo 1. The joystick at left

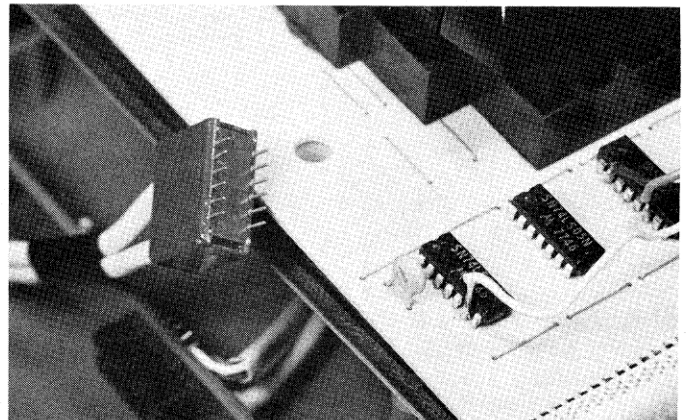


Photo 2. The Atari joystick comes with a nine-pin female plug, of which six are connected.

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```
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* * * * *
* LPRINT LLIST.*
* > > > END OF SOFTWARE HASSLES!! < < <
* * * * *
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```

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looking into the sockets with the row of five on top. Number the pins across with the upper left pin being number one, upper right pin number five, lower left pin number six and the lower right number nine. The following pins control the various functions: Pin 7 is the ground, pin 2 is left, pin 3 is right, pin 4 is down, pin 5 is up and pin 9 is fire. These directions are referenced with the fire button in the lower right position.

Since I couldn't locate a compatible nine-pin socket, I decided to use a 16-pin socket and plug. The joystick requires only six pins, but I thought I'd save the rest. I might construct a sec-

ond joystick later and use six more.

I had some three-wire intercom cable left from another project and decided to connect with it. Since I wanted to keep my joystick compatible with my Atari, I spliced the intercom cable and connected it into the joystick cable. I attached the other ends to the 16-pin plug. The socket was then mounted to the case of the TRS-80 by drilling holes through the sides and passing the pins of the socket through. The socket was held in place by bending the outer four pins back against the case. I ran two three-wire cables from the socket to the keyboard, leaving

plenty of slack for keyboard and main board removal.

To simplify my connections, I soldered the wires to the legs of the IC's rather than to the PC board.

The necessary connections are as follows: connect pin 7 of the Atari plug to pin 6 of Z1, pin 5 of the plug to pin 6 of Z3, pin 4 of the plug to pin 4 of Z3, pin 3 of the plug to pin 10 of Z3, pin 2 of the plug to pin 10 of Z4 and pin 9 of the plug to pin 4 of Z4. This completes the construction.

Running It

Attach the joystick to the computer now and check its operation. This is done by pushing

the stick forward to input 1 to the screen, right to input 2, back to input 3, left to input 4 and by pushing the button to input 5. The INKEY\$ function scans the keyboard for a single key input. Once this has been received by the computer, it cannot receive another until the contacts are opened again. This situation can be relieved by POKEing a zero into memory location 16442. Pushing the stick to a diagonal position will input two numbers, but the INKEY\$ function will only read the first number. The keyboard memory may now be checked for the second number, but this requires some knowledge of machine language. ■

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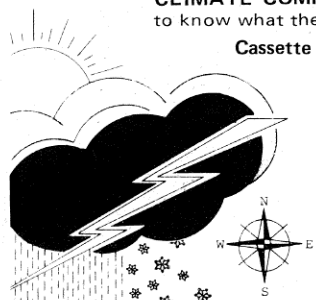
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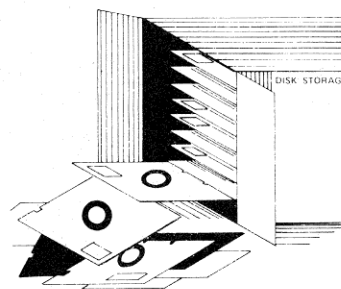
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Exponential Smoothing

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The eventual success of a business is based, in part, on management's ability to accurately forecast future demand for a product.

Forecasting is the science of predicting future events based in whole or in part on past performances. Many forecasting methods are available, running the gamut from educated guesses to highly mathematical techniques.

The technique known as exponential smoothing is a variation on a moving average forecast. In particular, exponential smoothing is based on a geometric progression which results in non-uniform weights being assigned to the available historical data. Exponential smoothing and the moving average techniques effectively reduce fluctuations in demand, at the same time remaining sensitive to trends. In other words, the values calculated for future demands are not subject to instantaneous, random peaks or drops, nor will a resulting trend be ignored before proper adjustments are made to the forecast values.

Requirements

The required variables for exponential smoothing include historical data which correspond to previous actual demand figures, the number of time periods to project into the future, and a constant known as the smoothing constant.

Historical data is usually available from sales figures for the product during a particularly representative time period. For example, monthly sales figures for a product can be gathered and used as the basis for the historical data points.

Program Listing. Exponential Smoothing.

```

1040 REM VARIABLE DESCRIPTION
1050 REM AD ACTUAL DEMANDS (HISTORICAL DATA)
1060 REM AF AVERAGE FORECAST ERROR
1070 REM BF LARGEST FORECAST ERROR
1080 REM CT CURRENT TREND VALUES
1090 REM DG # OF TIMES DEMAND > FORECAST
1100 REM DL # OF TIMES DEMAND < FORECAST
1110 REM EA EXPONENTIAL AVERAGES
1120 REM F FORECAST VALUES
1130 REM FE FORECAST ERRORS
1140 REM F2 FORECAST ERRORS SQUARED
1150 REM I GENERAL LOOP COUNTER
1160 REM LF SMALLEST FORECAST ERROR
1170 REM N # OF ACTUAL DEMAND TIME PERIODS
1180 REM NC # OF TIMES FORECAST >< ZERO
1190 REM NL # OF LINES PRINTED FOR TABULAR OUTPUT
1200 REM NP # OF PROJECTED TIME PERIODS
1210 REM Q ANSWER ( Y OR N ) TO QUESTION
1220 REM QN PRINT USING PARAMETER
1230 REM Q1 PRINT USING PARAMETER
1240 REM S SUM OF FORECAST ERRORS
1250 REM SC SMOOTHING CONSTANT VALUE
1260 REM SD STANDARD DEVIATION OF FORECAST
1270 REM SE STANDARD DEVIATION OF FORECAST ERROR
1280 REM ST SMOOTHED TRENDS
1290 REM S1 1.0 LESS THE SMOOTHING CONSTANT VALUE
1300 REM S2 SUM OF THE FORECAST ERRORS SQUARED
1310 DEFINT D, I, N
1320 DEFSTR A, B, C, E, F, L, S
1330 DEFSTR Q
1340 QN = "#####.###": Q1 = "####"
1350 CLS
1360 INPUT"ENTER > Y < FOR INSTRUCTIONS ELSE ENTER > N <":Q
1370 IF Q = "Y" THEN 2560 ELSE IF Q = "N" THEN 1380 ELSE 1350
1380 CLS
1390 INPUT"ENTER NUMBER OF TIME PERIODS OF ACTUAL DEMAND":N
1400 IF N <= 0 OR N >< INT(N) THEN STOP
1410 DIM AD(N), EA(N), CT(N), ST(N), F(N), FE(N), F2(N)
1420 CLS
1430 FOR I = 1 TO N
1440 PRINT,"ACTUAL DEMAND #";I;
1450 INPUT AD(I)
1460 NEXT I
1470 CLS
1480 INPUT"ENTER SMOOTHING CONSTANT":SC
1490 IF SC <= 0.00 OR SC > 1.00 THEN GOSUB 2430 : GOTO 1480
1500 CLS
1510 INPUT"ENTER NUMBER OF PROJECTED TIME PERIODS":NP
1520 IF NP <= 0 OR NP >< INT(NP) THEN GOSUB 2470: GOTO 1510
1530 CLS
1540 INPUT"ENTER > Y < FOR TABULAR OUTPUT ELSE ENTER > N <":Q

```

Program continues

A business which deals with a high turn-over product will want to forecast perhaps only one to three time periods into the future. On the other hand, a longer forecast time period is logical for a product whose demand remains widespread and steady—home heating oil, for example.

The major problem with exponential smoothing lies in choosing an appropriate smoothing value—the constant.

The smoothing constant must be a positive value between 0.00 and 1.00, where 0.00 results in complete smoothing while a smoothing constant of 1.00 results in a forecast with no smoothing ability. These extreme values are rarely used, however.

Generally, a smoothing constant between 0.01 and 0.30 yields reasonably accurate results; that is, a prompt response to change without a larger response to random fluctuations.

The smaller the smoothing constant value, the slower the response of the procedure to change. On the other hand, the larger the value of the smoothing constant, the quicker the response to change, as a much greater emphasis is placed on the most recent data.

"The major problem with exponential smoothing lies in choosing the appropriate smoothing value—the constant."

A product's market history will usually give a clue as to the correct magnitude of the smoothing constant. If the historical data is relatively stable, a small smoothing constant usually gives accurate forecasts. A seasonal pattern or other trend usually requires a large smoothing constant. Experience in your business is the prerequisite for forecasting future demand for a product.

One technique, known as retrospective simulation, is often used to determine the approximate values for the smoothing constant and the number of projected time periods. Basically, retrospective simulation (or Monday morning quarterbacking) uses the most recent marketing figures as control data and applies them to historical market information.

Various smoothing and projected time periods are applied to the historical data, until a reasonably good fit results. These same values are then applied to future demand predictions.

Operating Instructions

The initial response to the following program is either a Y or an N which will give either a brief instructional screen display or branch immediately to the data input phase. Entering a Y will present the necessary background information and operating

```

1550 IF Q = "Y" THEN GOSUB 2300 ELSE IF Q = "N" THEN 1570
                                           ELSE 1530
1560 REM INITIALIZE VARIABLES TO ZERO
1570 AF = 0.0: BF = 0.0: DG = 0.0: DL = 0.0: LF = 0.0: NC = 0
1580 S1 = 1.0 - SC
1590 FOR I = 1 TO N
1600   CT(I) = 0.0: EA(I) = 0.0: F(I) = 0.0
1610   FE(I) = 0.0: F2(I) = 0.0: ST(I) = 0.0
1620 NEXT I
1630 S = 0.0
1640 S2 = 0.0
1650 REM SET FIRST EXPONENTIAL AVERAGE TO FIRST ACTUAL DEMAND
1660 NL = 1
1670 EA(1) = AD(1)
1680 I = 1
1690 IF Q = "Y" THEN GOSUB 2380
1700 REM START OF MAIN LOOP
1710 FOR I = 2 TO N
1720 REM   CALCULATE EXPONENTIAL AVERAGE, CURRENT TREND
1730 REM   IF SMOOTHED TREND = ZERO
           THEN SMOOTHED TREND = CURRENT TREND
           ELSE CALCULATE SMOOTHED TREND
1740   EA(I) = (SC*AD(I)) + (S1*EA(I-1))
1750   CT(I) = EA(I) - EA(I-1)
1760   IF ST(I-1) = 0.0 THEN ST(I) = CT(I)
           ELSE ST(I) = (SC*CT(I)) + (S1*ST(I-1))
1770   IF NP+1 >= I THEN 1920
1780 REM   CALCULATE FORECAST VALUE
1790   F(I) = EA(I-NP) + ((S1/SC+FIX(NP))*ST(I-NP))
1800 REM   ACCUMULATE DEMAND > FORECAST OR DEMAND < FORECAST
1810   IF AD(I) > F(I) THEN DG = DG + 1 ELSE DL = DL + 1
1820 REM   CALCULATE FORECAST ERROR VALUE
1830   FE(I) = F(I) - AD(I)
1840 REM   DETERMINE LARGEST FORECAST ERROR
           AND SMALLEST FORECAST ERROR
1850   IF FE(I) > BF THEN BF = FE(I)
1860   IF FE(I) < LF THEN LF = FE(I)
1870 REM   CALCULATE FORECAST ERRORS SQUARED,
           SUM OF FORECAST ERRORS,
           SUM OF FORECAST ERRORS SQUARED
1880   F2(I) = FE(I)*FE(I)
1890   S = S+FE(I)
1900   S2 = S2+F2(I)
1910   IF F(I) >> 0.0 THEN NC = NC + 1
1920   IF Q = "Y" THEN GOSUB 2380
1930   IF NL = 13 THEN GOSUB 2510: GOSUB 2300
1940 REM   END OF MAIN LOOP
1950 NEXT I
1960 REM   CALCULATE AVERAGE FORECAST ERROR,
           STANDARD DEVIATION OF FORECAST,
           STANDARD DEVIATION OF FORECAST ERRORS
1970 FOR I = 1 TO N
1980   AF = AF+FE(I)
1990 NEXT I
2000 AF = AF/N: IF NC = 0 OR NC = 1 THEN SE=0: SD=0: GOTO 2030
2010 SE = SQR(ABS((S2-(S*S)/(NC))/(NC-1)))
2020 SD = SQR(ABS(S2/(NC-1)))
2030 GOSUB 2510
2040 REM   OUTPUT RESULTS ROUTINE
2050 PRINT@64,"SMOOTHING CONSTANT =";SC
2060 PRINT@128,NP,"PROJECTED TIME PERIODS"
2070 PRINT@256,"STANDARD DEVIATION OF FORECAST DISCREPANCY =";
2080 PRINT,SD
2090 PRINT@320,"STANDARD DEVIATION OF FORECAST ERROR =";
2100 PRINT,SE
2110 PRINT@448,"DEMAND GREATER THAN FORECAST";DG;"TIMES"
2120 PRINT@512,"DEMAND LESS THAN FORECAST";DL;"TIMES"
2130 PRINT@640,"CUMULATIVE FORECAST ERRORS =";S
2140 PRINT@704,"LARGEST POSITIVE FORECAST ERROR =";BF
2150 PRINT@768,"LARGEST NEGATIVE FORECAST ERROR =";LF
2160 PRINT@832,"AVERAGE FORECAST ERROR =";AF
2170 GOSUB 2510
2180 CLS
2190 PRINT@912,"ENTER APPROPRIATE OPTION NUMBER"
2200 PRINT@320,"OPTION DESCRIPTION"
2210 PRINT@389,"1 USE SAME ACTUAL DEMAND FIGURES BUT";
2220 PRINT" DIFFERENT"
2230 PRINT@457,"SMOOTHING CONSTANT AND/OR PROJECTED TIME";
2240 PRINT" PERIOD VALUES"
2250 PRINT@517,"2 USE DIFFERENT ACTUAL DEMAND FIGURES"
2260 PRINT@645,"3 STOP PROGRAM"
2270 PRINT@768,"ENTER OPTION NUMBER";
2280 INPUT I
2290 IF I = 1 THEN 1470 ELSE IF I = 2 THEN RUN 1310 ELSE STOP

```

Program continues

instructions for the program.

The program will then ask for the number of time periods for which actual market demand information is available; that is, the number of time periods for which historical data is present. Entering a zero for this question ends the program, while entering any other positive integer value dimensions the necessary arrays.

An OM ERROR may occur if the value for this variable is too large. Using a 16K TRS-80, the maximum value for this variable may approach 250 with no adverse effects. If no error occurs, the program will ask the operator for each actual demand value.

After all the actual demand values are entered, the program will ask for the smoothing constant value. A positive value between 0.00 and 1.00 is expected.

The number of projected time periods is the next request. This value must be a positive integer, one or above. This value, as well as the value for the previously entered smoothing constant, determines the accuracy of the forecast.

Finally, a Y or an N answer is required if the user wants a tabular output of the various forecast values during the execution of the program. These values are important if the user wants to see the intermediate results of the procedure.

The program then commences its calculations. If your answer to the tabular question is a Y, intermediate values during each time period for the actual demand, exponential average, current trend, smoothed trend, forecast demand and forecast error are displayed and frozen.

Eventually, the final results of the program are listed. These results include the standard deviation of forecast errors.

The number of times the actual demand was greater than and less than the forecast value is also listed. The cumulative forecast errors, the largest positive forecast error, the largest negative forecast error and the average forecast error will also be listed.

The operator can adjust the smoothing constant and/or the number of time periods projected into the future without re-entering the historical data by following the instructions on the last screen display. ■

```

2300 REM    TABULAR OUTPUT ROUTINE
2310 CLS
2320 NL = 1
2330 PRINT@65,"TIME    ACTUAL EXPONENTIAL CURRENT    SMOOTHED";
2340 PRINT@119,"FORECAST";
2350 PRINT@128,"PERIOD DEMAND    AVERAGE    TREND    TREND";
2360 PRINT@173,"FORECAST    ERROR"
2370 RETURN
2380 NL = NL + 1
2390 PRINT USING Q1;I;
2400 PRINT USING QN;AD(I);EA(I);CT(I);ST(I);F(I);FE(I)
2410 RETURN
2420 REM    ERROR MESSAGE ROUTINES
2430 CLS
2440 PRINT"0.01 <= SMOOTHING CONSTANT <= 1.00"
2450 GOSUB 2510
2460 RETURN
2470 CLS
2480 PRINT"NUMBER OF PROJECTED TIME PERIODS >= 1"
2490 GOSUB 2510
2500 RETURN
2510 PRINT@960,"PRESS > ENTER < TO CONTINUE";
2520 INPUT QE
2530 CLS
2540 RETURN
2550 REM    INSTRUCTION OUTPUT ROUTINE
2560 CLS
2570 PRINT@10,"FORECASTING BY EXPONENTIAL SMOOTHING"
2580 PRINT
2590 PRINT"    EXPONENTIAL SMOOTHING IS A VARIATION ON A MOVING"
2600 PRINT"AVERAGE FORECAST BASED ON A GEOMETRIC PROGRESSION "
2610 PRINT"RESULTING IN THE ASSIGNMENT OF NONUNIFORM WEIGHTS "
2620 PRINT"TO THE HISTORICAL DATA."
2630 PRINT"    THE REQUIRED INPUT PARAMETERS INCLUDE:"
2640 PRINT"1. THE HISTORICAL DATA; I.E. PAST ACTUAL DEMAND,"
2650 PRINT"2. A SMOOTHING CONSTANT,"
2660 PRINT"3. THE NUMBER OF PROJECTED TIME PERIODS."
2670 PRINT"    THIS PROGRAM USES A TYPE OF RETROSPECTIVE "
2680 PRINT"SIMULATION TO EXHIBIT THE EXPONENTIAL SMOOTHING "
2690 PRINT"FORECAST TECHNIQUE."
2700 GOSUB 2510
2710 PRINT"INPUT PARAMETER # 1"
2720 PRINT"    NUMBER OF ACTUAL DEMAND PERIODS; I.E. THE"
2730 PRINT"    NUMBER OF PERIODS FOR WHICH HISTORICAL DATA "
2740 PRINT"    IS AVAILABLE."
2750 PRINT"INPUT PARAMETER # 2"
2760 PRINT"    THE VALUES FOR EACH OF THE ACTUAL DEMAND "
2770 PRINT"    FIGURES."
2780 PRINT"INPUT PARAMETER # 3"
2790 PRINT"    SMOOTHING CONSTANT VALUE. THIS VALUE MUST BE "
2800 PRINT"    BETWEEN +0.01 AND +1.00"
2810 PRINT"INPUT PARAMETER # 4"
2820 PRINT"    NUMBER OF PROJECTED TIME PERIODS IS THE "
2830 PRINT"    FORECASTED FUTURE TIME PERIODS."
2840 GOSUB 2510
2850 PRINT"INPUT PARAMETER # 5"
2860 PRINT"    INTERMEDIATE OUTPUT IS AVAILABLE BY ANSWERING "
2870 PRINT"    'Y' TO THIS QUESTION."
2880 GOSUB 2510
2890 GOTO 1380
2900 END

```

MOVING?

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TRS-80 Model I BASIC Compilers

Table below shows the BASIC subset translated by **ACCEL** and **ACCEL2** to machine code. Figures represent the minimum expected ratio of execution times, compiler to interpreter. All other BASIC statements and functions run at interpreter speed after compilation.

| | INTEGER | SINGLE | DOUBLE | STRING |
|--|---------|--------|--------|--------|
| Assignment (LET) | 115 | 3.3 | 3.4 | 7.6 |
| Array Reference (1-dim) | 35 | 78 | 66 | 34.5 |
| AND or OR | 41 | 2.5 | 2.0 | |
| Compare (<, etc) | 30 | 1.6 | 1.4 | 4.2 |
| Add, Subtract, Concat | 47 | 2.0 | 1.5 | 4.9 |
| Multiply (*) | 3.3 | 2.0 | 1.5 | |
| Divide (/) | 2.0 | 2.0 | 1.02 | |
| Reference to a constant | 69 | 65 | 54 | 2.1 |
| FOR with NEXT | 15 | | | |
| POKE | 82 | 4.6 | 3.6 | |
| SET or RESET | 6.7 | 3.1 | 2.6 | |
| IF THEN ELSE | 11.1 | 3.0 | 2.3 | 7.6 |
| ON expression GOTO | 15.8 | 3.2 | 2.8 | |
| Functions | | | | |
| VARPTR | 33 | 47 | 47 | 44 |
| USR | 11.2 | 3.7 | 2.8 | |
| POINT | 6.9 | 3.0 | 2.5 | |
| PEEK | 52 | 4.4 | 3.5 | |
| LEN | | | | 43 |
| MID\$ | | | | 4.1 |
| LEFT\$ | | | | 3.0 |
| RIGHT\$ | | | | 2.8 |
| CHR\$ | | | | 4.7 |
| ASC | | | | 30 |
| CVI | | | | 28 |
| Flow of Control | | | | |
| GOSUB with RETURN | 137 | | | |
| GOTO | 204 | | | |
| All other BASIC statements and functions | 1.0 | 1.0 | 1.0 | 1.0 |

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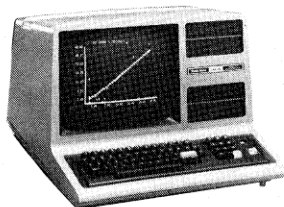
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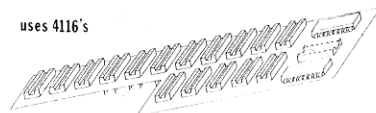
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Compare

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Compare is a program that compares two BASIC programs stored on disk to ensure they are identical. It was written to guarantee the accuracy of a load input from tape and stored in Level II BASIC in ASCII (SAVE "file name",A) format. The programs should be saved under different name.

Features

The features of Compare are as follows:

- Compares two programs stored on disk in ASCII format (lines 190 and 270).
- Lists unequal lines by line number (line 270).
- Lists the total number of lines in the program (lines 220 and 240).
- Lists the total number of characters in the program (lines 220 and 250).
- Execution terminates if a line number appears in one of the programs being compared and not in the other (line 260).
- If one program has more

lines than the other, an error statement is printed (lines 170 and 180).

- Execution will terminate if more than 10 lines are unequal (line 270).

- If the same program name is entered for both programs, Compare counts the number of lines and characters and lists their totals (lines 120 and 130).

- Checks that both programs being compared are stored on disk in the ASCII format (lines 200 and 210).

Side by Side

The program briefly explains what it does and then prompts the user to enter the names of the programs to be compared. The program runs by itself. It lists a running total of the number of lines and characters read and the number of the line currently being compared in the program.

The only caution to be observed is that the program must be allowed to run until it finishes. If the break key is used to stop execution, the files being read from may not be closed.

Compare reads the program it

is comparing line by line from disk. It will take about four minutes to compare two 13K programs.■

```

40 CLS:PRINT@128,TAB(20)"PROGRAM COMPARISON
50 PRINT@256,"THIS PROGRAM CMPARES TWO BASIC PROGRAMS
   THAT HAVE BEEN STORED
60 PRINT"ON DISC IN THE ASCII FORMAT. IT LISTS UNEQUAL
   LINES BY NUMBER.
70 PRINT"IT ALSO WILL TELL YOU THE TOTAL NUMBER OF CHAR
   ACTERS AND LINES
80 PRINT"CONTAINED IN A PROGRAM.
90 PRINT@640,"DEPRESS ENTER TO CONTINUE";:INPUT A$
100 CLEAR MEM/3
110 F$=" IS NOT STORED IN ASCII FORMAT. PROGRAM TERMIN
   ATED!"
120 CLS:PRINT@192,"WHAT IS THE NAME OF THE FIRST PROGRA
   M";:INPUT A$
130 PRINT@320,"WHAT IS THE NAME OF THE SECOND PROGRAM";
   :INPUT B$
140 OPEN "I",1,A$: OPEN "I",2,B$
150 CLS
160 IF EOF(1) AND EOF(2) THEN CLOSE: PRINT@768,"COMPARI
   SON COMPLETE": END
170 IF EOF(1) THEN CLOSE: PRINT@768,"THE LAST LINE IN "
   ;A$;" HAS BEEN REACHED":PRINT B$;" HAS ADDITIONAL
   LINES REMAINING": END
180 IF EOF(2) THEN CLOSE: PRINT@768,"THE LAST LINE IN "
   ;B$;" HAS BEEN REACHED":PRINT A$;" HAS ADDITIONAL
   LINES REMAINING": END
190 LINE INPUT#1,C$: LINE INPUT#2,D$
200 IF VAL(C$)=0 THEN CLS: PRINT@512,A$+F$: CLOSE: END
210 IF VAL(D$)=0 THEN CLS: PRINT@512,B$+F$: CLOSE: END
220 A=A+1: B=B+LEN(C$)
230 PRINT@128,"LINE NUMBER CURRENTLY BEING READ FROM ";
   A$;TAB(50)VAL(C$);" "
240 PRINT@256,"TOTAL NUMBER OF LINES READ";TAB(50)A;
250 PRINT@384,"TOTAL NUMBER OF CHARACTERS IN ";A$;TAB(5
   0)B;
260 IF VAL(C$)<>VAL(D$) THEN PRINT@512,"LINE NUMBERS AR
   E DIFFERENT STARTING WITH LINE";BAL(C$);"IN ";A$:P
   RINT"THE PROGRAM HAS BEEN TERMINATED.": CLOSE:END
270 IF C$<>D$ THEN E$=E$+STR$(VAL(C$))+",": PRINT@640,"
   UNEQUAL LINES ";E$: X=X+1: IF X>10 THEN PRINT@768,
   "MORE THAN TEN LINES ARE UNEQUAL THE PROGRAM IS TE
   RMINATED": CLOSE: END
280 GOTO 160

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achieved by placing an end connector at the end of the board in the TRS-80 bus format, allowing for the chaining of two expansion motherboards if necessary, or placing the Expansion-80 between the CPU and the Radio Shack expansion interface.

Another advantage can be realized if a 40-pin card-edge jumper assembly, such as the A P Products P/N 924065-36-R, is connected to a 44-pin connector. This will make a neat connection for a single board project, or will temporarily connect one of several boards such as a PROM programmer.

The only disadvantage to this system is the fact that Radio

Shack does not support it and no commercial interface boards are presently available. However, I would bet that after a standard expansion bus has been established, there will be many. An expansion bus is sold under part number GPA-80 by Electronic Systems in California. When I called for information on the pinouts, it was not available.

By placing a standard in public domain, anyone can make and sell motherboards. The bare board should be priced at \$10.00 and by using junk box edge connectors and parts, the unit probably can be built for less than \$20.00.

The 44-pin assignment is simple. First, the standard 44-pin identification of 1-22 and A-Z is discarded, and re-identified in the TRS-80 format (1-43 and 2-44). Next, pin 41 is assigned -8 volts, pin 42 is assigned +8 volts, pin 43 is assigned -12 volts and pin 44 is assigned +12 volts. This allows the use of the pin identification, found in the TRS-80 manuals. Also, the power supply voltages are assigned, starting with the lowest voltage to the lowest pin (#41) of the four extra pins.

The data bus is buffered both ways, but the address bus and other signal lines are not. The data bus drivers are three-state

output devices and their outputs are high impedance until the enable inputs are pulled low. When either the RD* or IN* outputs go low, the tri-stated data buffers are enabled by the AND gate (IC1). Similarly, if either the OUT* or WR* go low, the other AND gate will enable the data bus buffers for output.

This version was chosen because I did not plan to use Direct Memory Access (DMA) from the motherboard, as required by the Radio Shack screen printer.

The computer outputs of CAS*, SYSRES*, RAS*, and MUX*, are not shown in the schematic but are wired the same as the WAIT* output. ■

™ TRS80 color

From the January 1981 issue of the CSRA Computer Club newsletter:

There was some amusement at the November meeting when the Radio Shack representatives stated that the software in the ROM cartridges could not be copied. This month's 68 Micro Journal reported they had disassembled the programs on ROM by covering some of the connector pins with tape. They promise details next month. Never tell a hobbyist something can't be done! This magazine seems to be the only source so far of technical information on the TRS-80 color computer™. Devoted to SS-50 6800 and 6809 machines up to now, 68 Micro Journal plans to include the TRS-80 6809 unit in future issues.

NOTE: This and other interesting and needed articles for the Radio Shack TRS-80 color computer™ are being included monthly in 68 Micro Journal—The Largest specialty computer magazine in the world!

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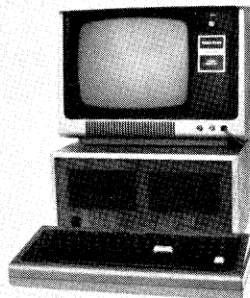
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TERMINAL/RS-232 INTERFACE DEFINITIONS

A **terminal** is basically two independent units housed together. One unit is the keyboard (or any other input device) which allows the user to communicate to the machine. The other is the display which allows the machine to communicate with the user. (See Fig. 1.)

The **RS-232 interface** provides a standard serial communications protocol between the user and the computer. It was developed in 1969. Serial communications employ one line for each direction. The RS-232C Standard defines voltage levels and impedances.

As the terminal user types a character on the keyboard, the ASCII code for that key, along with sync bits, is transmitted through the interface to the computer. Incoming characters are similarly obtained from the interface on the receive line, and put on the screen for display.

The Radio Shack TRS-80 can be easily modified to act as a terminal capable of communicating with any RS-232 compatible peripheral. Surprisingly inexpensive to implement, the RS-232 interface involves only one transistor, some unused IC gates, a few resistors and the following software.

The RS-232 compatible hardware and hardware level shifters are unused IC gates in the TRS-80, along with a single transistor and a few resistors. Software links the hardware interfaces, the TRS-80's keyboard and tv monitor. These links have been made using 4K of RAM and Level I BASIC (or 16K of RAM and Level II BASIC).

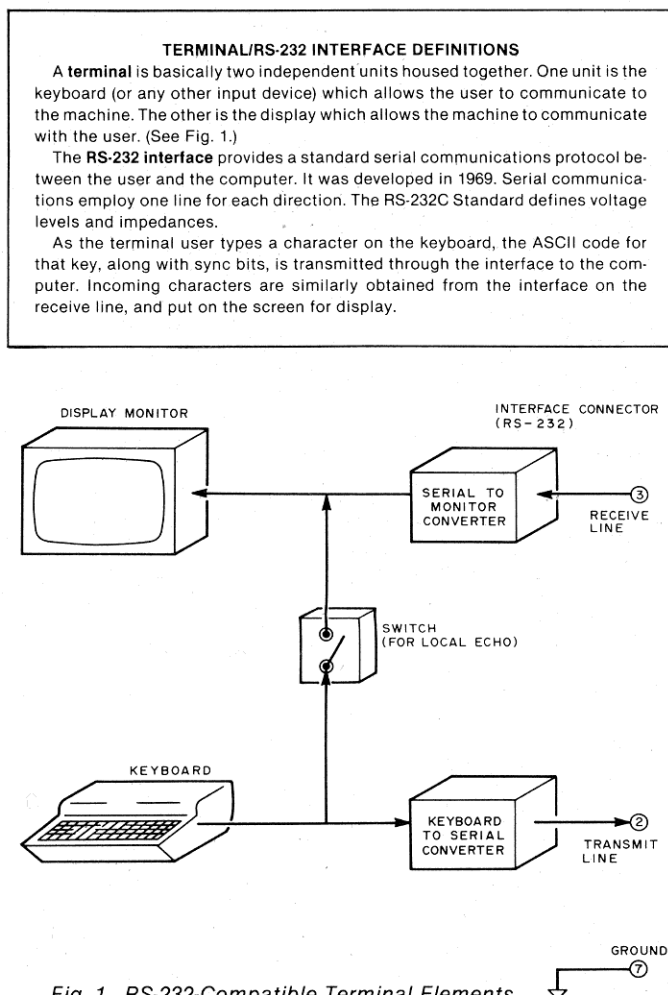


Fig. 1. RS-232-Compatible Terminal Elements

Easy Hardware Changes

The hardware changes necessary to convert the TRS-80 into an RS-232 compatible terminal are shown in Fig. 2. Z7 is a 74LS74 Dual "D" Flip flop. The higher numbered half is unused with all inputs tied to ground.

(Incidentally, an error was discovered in the TRS-80 schematic in that the Q output is labeled seven but must be nine since seven is ground on a 74LS74.) These inputs need to be removed from ground and connected as shown. This connects the flip flop to bit four of output port FF₁₆, previously unused. The Q output of the flip flop is

$$(\text{Time Delay} = \frac{1}{\text{Baud Rate}})$$

| Baud Rate | Time Delay (msec) |
|-----------|-------------------|
| 110 | 9.091 |
| 300 | 3.333 |
| 600 | 1.667 |
| 1200 | .833 |
| 1800 | .556 |
| 2400 | .417 |

Table 1. Baud Rates and Times Between Bits

2-A CHARACTER IN-REGISTER INSTRUCTION LOOP TIME

| Start Bit to Data Bit | | |
|-----------------------|-----------------|------------------|
| Line Number | Instruction | Number of Cycles |
| 97 | AND n | 7 |
| 98 | JR NZ (jumps) | 12 |
| 106 | LD B,n | 7 |
| 107 | LD D,n | 7 |
| 108 | LD E,n | 7 (Total: |
| 109 | CALL nn | 17 83) |
| 110 | IN A, (n) | 12 |
| 111 | AND n | 7 |
| 112 | JR Z, (no jump) | 7 |

Delay Between Bits

| Line Number | Instruction | Number of Cycles |
|-------------|--------------|------------------|
| 116 | NOP | 4 |
| 117 | LD E, n | 7 |
| 118 | CALL nn | 17 |
| 119 | IN A, (n) | 12 (Total: |
| 120 | AND n | 7 91) |
| 121 | OR r | 19 |
| 122 | LD r, r' | 4 |
| 123 | RRC r | 8 |
| 124 | DJNZ (jumps) | 13 |

2-B CHARACTER OUT-REGISTER

| Start Bit Generated to Loop | | |
|-----------------------------|-------------|------------------|
| Line Number | Instruction | Number of Cycles |
| 168 | RLC r | 8 |
| 169 | RLC r | 8 |
| 170 | RLC r | 8 (Total: |
| 171 | LD r, n | 7 71) |
| 172 | CALL n, n | 17 |
| 173 | LD r, r' | 4 |
| 174 | CPL | 7 |
| 175 | AND n | 12 |

| Loop Time Between Bits | | |
|------------------------|--------------|------------------|
| Line Number | Instruction | Number of Cycles |
| 177 | RRC r | 8 |
| 178 | DJNZ (jumps) | 13 |
| 171 | LD r, n | 7 (Total: |
| 172 | CALL n | 17 72) |
| 173 | LD r, r' | 4 |
| 174 | CPL | 4 |
| 175 | AND n | 7 |
| 176 | OUT (n), r | 12 |

2-C 300 BAUD DELAY LENGTH IN CYCLES

| Loop Time | | |
|-------------|-------------|------------------|
| Line Number | Instruction | Number of Cycles |
| 205 | NOP | 4 |
| 206 | NOP | 4 |
| 207 | NOP | 4 |
| 208 | NOP | 4 (Total: |
| 209 | NOP | 4 36) |
| 210 | DEC r | 4 |
| 211 | JR NZ, nn | 12 |

| Loop Overhead (One Time Per Use) | | |
|----------------------------------|-------------|------------------|
| Line Number | Instruction | Number of Cycles |
| 205 | NOP | 4 |
| 206 | NOP | 4 |
| 207 | NOP | 4 (Total: |
| 208 | NOP | 4 58) |
| 209 | NOP | 4 |
| 210 | DEC E | 4 |
| 211 | JR NZ | 7 |
| 212 | RET | 10 |
| Call to Subroutine | | 17 |

2-D DELAY TIME FORMULA DERIVATION

$$\frac{1}{\text{Baud Rate}} = \text{Time to be Used Up in Delay Loop} + \text{Program Time Needed to Process Bits}$$

$$T = (\text{Number of loop passes} - 1) (\text{Time used by 1 loop}) + (\text{loop overhead} + \text{program processing time})$$

$$T = (N - 1) (M_L (.56\mu s)) + (LOH + PRT) (.56\mu s)$$

Where: N = Number of loops to be done

M_L = Machine cycles per loop

LOH = Loop entry and exit overhead

PRT = Program processing time

Solve for N:

$$T = (N) (M_L (.56\mu s)) - (M_L (.56\mu s)) + (LOH + PRT) (.56\mu s)$$

$$(N) (M_L (.56\mu s)) = T + (M_L (.56\mu s)) - (LOH + PRT) (.56\mu s)$$

$$N = \frac{T + (M_L (.56\mu s)) - (LOH + PRT) (.56\mu s)}{(M_L (.56\mu s))}$$

$$N = \frac{\frac{T}{.56\mu s} + M_L - LOH - PRT}{M_L}$$

2-E DELAY LOOP CALCULATIONS FOR 300 BAUD

(A) Character In-register Start Bit to Data Bit

$$\begin{aligned} M_L &= 36 \\ LOH &= 58 \\ PRT &= 83 \\ T &= 1667\mu s \text{ (1/2 data width)} \end{aligned}$$

$$N = \frac{\frac{1667\mu s}{.56\mu s} - 58 - 83}{36} + 1 = 79.77$$

Use 80
(See line 4 of listing.)

(B) Character In-register Delay Between Bits

$$N = \frac{\frac{3333\mu s}{.56\mu s} - 58 - 91}{36} + 1 = 162.18$$

Use 162
(See line 5 of listing.)

(C) Character Out-register

Since both times are within 1 cycle use same for both.

$$N = \frac{\frac{3333\mu s}{.56\mu s} - 58 - 71}{36} + 1 = 162.74$$

Use 163
(See line 3 of listing.)

Table 2. Details of Calculations for 300 Baud

used to drive a 2N3906 level shifter so that the output to the RS-232 line pin two is a signal that swings from +5V to -5V.

To provide the input level shifter, a resistor divider is used to attenuate the positive voltage

and a diode clamps the negative voltage.

With these modifications, whenever output port FF_{16} is written to by software, the value of bit four is strobed to the transmit line. Also, whenever input

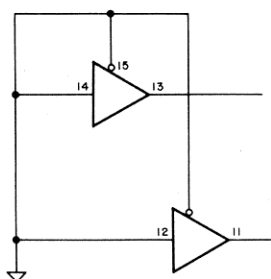
port FF_{16} is read, the status of the receive line is transferred to bit four of the A register. Software can thus control the timing of the level changes on the transmit line and can inspect the receive line to decipher any

coming characters.

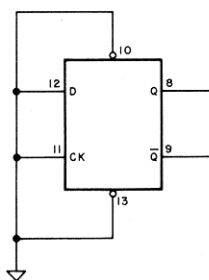
Software Links it All Together

The Program Listing provided is for Level I BASIC in the 4K TRS-80. It alternately checks both the keyboard and the RS-

ORIGINAL :



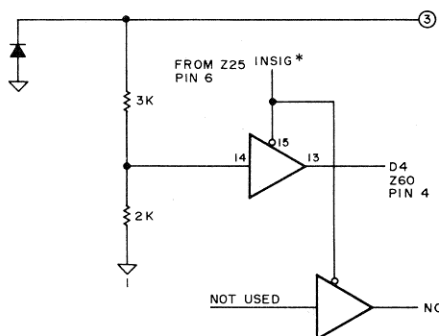
ORIGINAL :



INPUT

OUTPUT

MODIFIED :



MODIFIED :

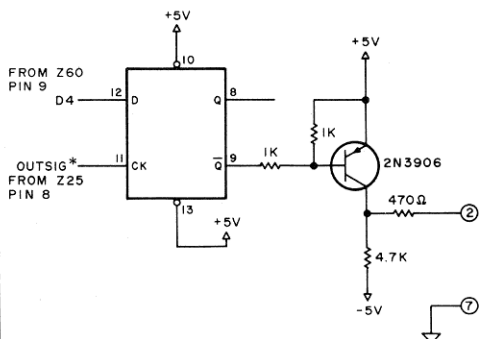


Fig. 2. Hardware Changes

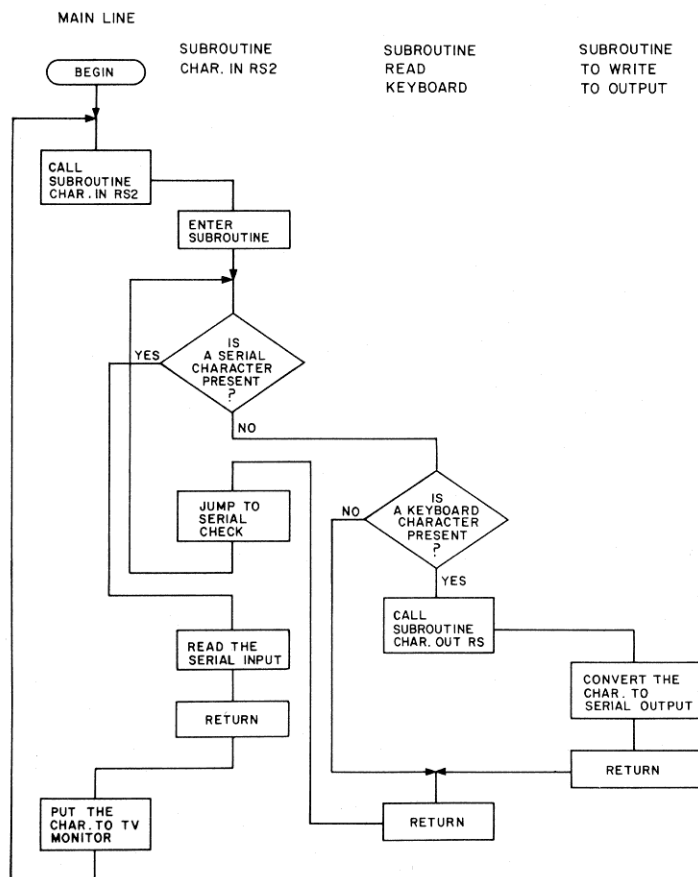


Fig. 3. Software Flowchart

of the collection, and assembly of the bits. Unfortunately, the screen monitor software driver in the Level I ROM doesn't use ASCII for all characters: It expects an $1D_{16}$ for the backspace. A check for a backspace 08_{16} is therefore needed. When this character is seen, it is converted to the expected $1D_{16}$ before calling the screen monitor driver. Also, lowercase characters are converted to uppercase before the lowercase tv driver is invoked.

When rapid checking of both inputs shows a keystroke, the keystroke is intended for the serial output line. Since Radio Shack used non-ASCII codes for some keys, they must first be converted to ASCII. A software driver is used to convert the characters to a serial output and add the start and stop bits.

Selecting the Baud Rate

The time delays required between sampling each bit on the serial input and sending each bit on the output are set with a software delay routine. In the program listing, the delays are set to 3.333 ms between bits (300 baud).

Adding a modem allows operation with larger computer systems over phone lines. The time delays can be altered to allow operation from 110 to 2400 baud (Table 1).

The delay routine is at the end of the program because longer lengths are required for the slower rates (110 and 300 baud). It is important that the proper time interval be allowed between the data bits. Some time is required to read and process each bit in building the parallel form.

The remainder of the time is used up by a delay routine. The length of time spent in the delay depends on the value in the E register when the subroutine is called.

Calculations are detailed for 300 baud in Table 2, 110 baud in Table 3, 1200 baud in Table 4. Three delays are needed, two for input and one for output.

Two delays are required for the input because a delay of $\frac{1}{2}$ the time allows a second sam-

232 input line as rapidly as possible. If a keystroke is detected, it goes to the RS-232 output for transmission. If data is detected on the RS-232 input line, the character is read and sent to the screen. The flow chart in Fig. 3 illustrates this program.

The main line is very small and begins with a call to the RS-232 input routine. Only when a valid character is received on the serial input line is this routine exited. Control then transfers to the main line. The next line of code in the main program fixes the character for the tv screen software driver in Level I ROM, and a call to that driver, RST 2, prints the character on the screen.

As shown in the flowchart, if a start bit is found on the serial input line, the data bits are read and assembled into the received character. The routine is then exited, with control passing back to the main line.

The CHAR.INRS2 subroutine provides the details, the timing

Time Delays for 110 Baud

| Loop time Line Number | Instrument | Number of Cycles |
|--------------------------|---------------|---------------------|
| 205 | NOP | 4 |
| 206 | NOP | 4 |
| 207 | NOP | 4 |
| 208 | NOP | 4 |
| 209 | NOP | 4 |
| 210 | NOP | 4 |
| 211 | NOP | 4 |
| 212 | NOP | 4 |
| 213 | NOP | 4 |
| 214 | NOP | 4 |
| 215 | NOP | 4 |
| 216 | NOP | 4 |
| 217 | DEC r | 4 |
| 218 | JR NZ | 12 |
| | | 64 cycles |
| Loop Overhead | | |
| | 12 NOP's | 48 |
| | DEC r | 4 |
| | JR | 7 |
| | CALL TO DELAY | 17 |
| | RET | 10 |
| | | 86 cycles |

110 Baud T = 9091μs

(A) Start Bit to Data Bit

$$N = \frac{4545\mu s}{.56\mu s} - 86 - 90 + 1 = 125.06$$

Use 125

(B) Delay between input bits

$$N = \frac{9091\mu s}{.56\mu s} - 86 - 91 + 1 = 251.8$$

Use 252

(C) Output Delay

$$N = \frac{9091\mu s}{.56\mu s} - 86 - 72 + 1 = 252.1$$

Use 252

Table 3. Time Delays for 110 Baud

pling of the start bit. Two advantages are provided by this second sampling. One is immunity to noise spikes of widths less than 1/2 bit time. If either sampling yields no start bit, the character read is aborted.

The second advantage is that the start bit is sampled at its center. This is superior to sampling the data bits at their transition points because if a shift in timing occurred at either the transmitting or receiving end, bad reads would result.

Baud rates faster than 2400 are not practical, because the

time to process the bits is nearly as long as the time between bits.

A cycle time of 0.56 usec is used for all calculations. (The TRS-80 is driven by a 1.77 MHz clock.)

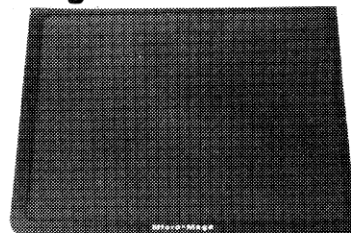
Operating As a Terminal Or a Computer

The TRS-80 acting as its own terminal outputs on pin 2 and examines pin 3 for incoming characters. As a computer, the machine outputs on pin 3 and checks pin 2 for inputs. If one wants to use the RS-232 inter-

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✓ 29



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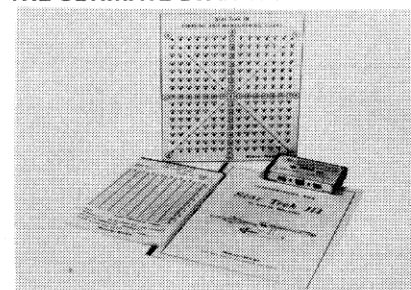
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| | | | |
|---------------|------|----|-----------|
| DELAY | DEC | r | 4 |
| | JR | NZ | 12 |
| | | | 16 cycles |
| Loop Overhead | DEC | r | 4 |
| | JR | NZ | 7 |
| | CALL | nn | 17 |
| | RET | | 10 |
| | | | 38 |

TIME DELAYS FOR 1200 BAUD

T = 833μs
(A) Start Bit to Data Bits

$$N = \frac{417\mu s}{.56\mu s} - 38 - 90 = 39.5 \text{ Use } 40$$

(B) Delay Between Bits

$$N = \frac{833\mu s}{.56\mu s} - 38 - 90 = 87.1 \text{ Use } 87$$

(C) Output Delay

$$N = \frac{9090\mu s}{.56\mu s} - 86 - 72 = 252.1 \text{ Use } 252$$

Table 4. Baud Rates of 600, 1200, 1800, and 2400

face to connect the TRS-80 to a line printer, punched tape reader, or any other RS-232 compatible device, one simply ensures that the TRS-80 signal is transmitted on pin 3 and inputs are received on pin 2. This is easily done by reversing the two existing wires. Pin 7 is used for ground in either case.

A timing problem occurs when the screen fills and is required to scroll (shift its contents upward). Since software scrolls the TRS-80 screen, the MPU is busy shifting the screen and not examining either the keyboard or the serial input line. Therefore characters coming in on the serial input are occasionally missed or read incorrectly.

An easy solution is to allow a time delay long enough for the TRS-80 to scroll the screen between carriage returns or line feeds and the next character.

The problem doesn't occur during output because the user typing on the keyboard is slower than the scroll. In actual use I find that clearing the screen before it fills or using a time delay between a carriage return and the next character eliminates

only (to drive a peripheral) this modification is both excellent and inexpensive. It can be used with any peripheral using seven data bits and no parity bit.

The Level II listing operates much the same way as the described Level I listing. The main

| Baud Rate | NOP s In Delay Loop | DELAY COUNT | | | |
|-----------|---------------------|-----------------------|-------------------|------------------------|-------------------|
| | | Input Memory Location | | Output Memory Location | |
| | | 4466 (Base 10 16) | 4477 (Base 10 16) | 44A1 (Base 10 16) | 44B0 (Base 10 16) |
| 110 | 12 | 125 70 | 252 FC | 252 FC | |
| 300 | 5 | 80 50 | 163 A3 | 163 A3 | |
| 600 | 0 | 86 56 | 179 B3 | 180 B4 | |
| 1200 | 0 | 40 28 | 87 57 | 87 57 | |
| 1800 | 0 | 24 18 | 55 37 | 56 38 | |
| 2400 | 0 | 16 10 | 41 29 | 39 27 | |

Note: Beyond 2400 baud, time-to-process > time between bits.

Table 5. Delay Times for 110 to 2400 Baud

the problem.

The serial input and output software drivers are designed to stand alone. If you need output

differences are the results from the location of the ROM KB input routine and the tv output driver. Their starts are located in lines 11 and 12 of the Level II listing.

The changes needed to make the RS-232 characters ASCII are slightly different, resulting in differences in the FIX2TV and FIX2RS routines. Those changes are in lines 29 to 65 of the listing.

These programs will work on any computer with 4K or more RAM. Type the programs in by copying the machine language using a program like T-BUG. ■

References

- Electronic Industries Association RS-232C Specification.
- EDN Magazine articles; "Binary Serial Interfaces—Making the Direct Connection" (April 20, 1976), and "Design a Low-cost CRT Terminal Around a Single-Chip Microprocessor" (May 5, 1977).
- Radio Shack TRS-80 Micro Computer Technical Reference Handbook, First Edition, 1978, page 108 (Schematic Sheet 2).
- Tektronix 4051 Data Communication Interface Manual, Section 2; "Data Communication Terms."
- "300 Baud Terminal," by Timothy Loos, 80 Microcomputing, August 1980, page 136.

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| 195 | DELAY ROUTINE |

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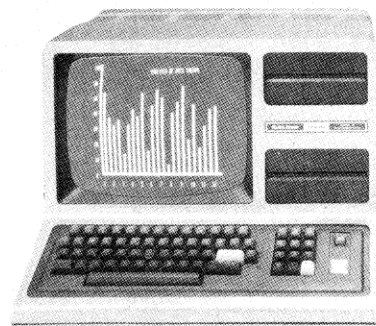


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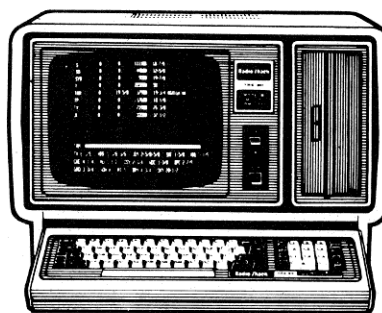
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Program Listing—Level I

Z80 ASSEMBLER V1.8C 79/12/20. 15.19.07. FILE NAME--TERM1--300 BAUD TERMINAL
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Z80 ASSEMBLER V1.8C 79/12/20. 15.19.07. FILE NAME--TERM1--300 BAUD TERMINAL
EQUILIVANTS

| | | | | | | |
|----|------|------|----------|-------------|---------------|--|
| 3 | | 00A3 | PUT.DLY | EQU | 163 | |
| 4 | | 0050 | ST.HDLY | EQU | 80 | |
| 5 | | 00A2 | ST.WHDLY | EQU | 162 | |
| 6 | | 45FF | TOPSTK | EQU | \$45FF | |
| 7 | | 4091 | MON.TOP | EQU | \$4091 | THE RE-ENTER OF THE MONITOR |
| 8 | | 0B40 | INPUT.KB | EQU | \$B40 | |
| 9 | | 00FF | INPORT | EQU | \$FF | |
| 10 | | 00FF | OUTPORT | EQU | \$FF | |
| 11 | | | | | | |
| 12 | | 4400 | ORG | \$4400 | | |
| 13 | 4400 | 31 | BEGIN LD | SP, TOPSTK | | SET UP THE STACK |
| 14 | | | | | | |
| 15 | | | | | | |
| 16 | | | | | | |
| 17 | 4403 | CD | 4744 | COMP CALL | CHAR.INRS2 | |
| 18 | 4406 | CU | 0C44 | CALL | FIX2TV | FIX FROM ASCII TO TRS-80 CONTROL CHAR |
| 19 | 4409 | D7 | | RST | 2 | |
| 20 | 440A | 18 | F7 | JR | COMP | |
| 21 | | | | | | |
| 22 | 440C | FE | 08 | FIX2TV CP | 08 | |
| 23 | 440E | 20 | 02 | JR | NZ, NOT.BK | |
| 24 | 4410 | 3E | 10 | LD | A, \$10 | |
| 25 | 4412 | D6 | 60 | NOT.BK SUB | \$60 | CHECK FOR LOWER CASE LETTERS |
| 26 | 4414 | F2 | 1B44 | JP | P, LOWCASE | |
| 27 | 4417 | C6 | 60 | ADD | \$60 | ADD BACK IN |
| 28 | 4419 | 18 | 02 | JR | RT | |
| 29 | 441B | C6 | 40 | LOWCASE ADD | \$40 | LOWER CASE SO CONVERT TO UPPER |
| 30 | 441D | C9 | | RT RET | | CALL THE OUTPUT ROUTINE |
| 31 | | | | | | |
| 32 | | | | * | | |
| 33 | | | | * | | |
| 34 | | | | * | | TRS-80 GIVES \$1B FOR UP ARROW SO THIS CAN BE USED FOR ESC |
| 35 | 441E | FE | 1C | FIX2KR CP | \$1C | CHECK FOR DOWN ARROW--IF SO GIVE OUT A LINEFEED |
| 36 | 4420 | 20 | 02 | JR | NZ, NOT.LF | |
| 37 | 4422 | 3E | 0A | LD | A, \$A | |
| 38 | | | | * | | |
| 39 | 4424 | FE | 10 | NOT.LF CP | \$10 | CHECK FOR LEFT ARROW --IF SO GIVE A BACKSPACE |
| 40 | 4426 | 20 | 02 | JR | NZ, NOT.BS | |
| 41 | 4428 | 3E | 08 | LD | A, 8 | |
| 42 | | | | * | | |
| 43 | 442A | FE | 1E | NOT.BS CP | \$1E | CHECK FOR RIGHT ARROW--IF SO MAKE A TAB |
| 44 | 442C | 20 | 05 | JR | NZ, NOT.TAB | |
| 45 | 442E | 3E | 20 | LD | A, \$20 | PUT A SPACE OUT TO THE TUBE |
| 46 | 4430 | D7 | | RST | 2 | |
| 47 | 4431 | 3E | 09 | LD | A, \$9 | |
| 48 | | | | * | | |
| 49 | 4433 | FE | 0C | NOT.TAB CP | \$C | CHECK FOR CLEAR TUBE AND IF SO SEND NULL |
| 50 | 4435 | 20 | 02 | JR | NZ, NOT.CLEAR | |
| 51 | 4437 | 3E | 7F | LD | A, \$7F | LOAD UP \$7F FOR TRANSMISSION--COMPUTER IGNORES THIS |
| 52 | | | | * | | |
| 53 | 4439 | C9 | | NOT.CLEAR | RET | |
| 54 | | | | | | |
| 55 | | | | * | | |
| 56 | | | | * | | FOR THE KEYBOARD -- |
| 57 | | | | * | | Z = NO KEY DOWN |
| 58 | | | | * | | NZ = A KEY DOWN |

Z80 ASSEMBLER V1.8C 79/12/20. 15.19.07. FILE NAME--TERM1--300 BAUD TERMINAL
EQUILIVANTS

| | | | | | | |
|----|------|----|------|----------------|----------|---|
| 59 | | | | * | | |
| 60 | 443A | CD | 400B | CHAR.INKB CALL | INPUT.KB | GO GET THE KEY |
| 61 | 443D | 28 | 07 | JR | Z, DONE | DONE IF NO KEY EXIT WITH Z FLAG SET TO 1 |
| 62 | 443F | FE | 03 | CP | 3 | CHECK FOR BREAK ON THE TRS-80 |
| 63 | 4441 | 20 | 03 | JR | NZ, DONE | DONE IF NOT ZERO, THEN THERE WAS A KEY SO RETURN WITH |
| 64 | | | | * | | Z SET TO 0 BECAUSE IT WASN'T BREAK |
| 65 | 4443 | CD | 9140 | CALL | MON.TOP | IT WAS BREAK SO GO TO TOP OF THE MONITOR |
| 66 | 4446 | C9 | | DONE RET | | |

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68      *
69      *
70      *   INPUT RS232 DRIVER
71      *
72      *   USES REGISTERS AS LISTED BELOW
73      *
74      *   A--IS USED FOR THE INPUT
75      *   B--IS USED TO HOLD THE BIT COUNT
76      *   D--IS USED TO BUILD THE CHARACTER
77      *   E--IS USED FOR THE DELAY COUNTER
78      *
79      *   CALL WITH 'CALL CHAR.INRS2'
80      *   RETURNS WITH 'RET' WITH THE CHAR IN A REG
81      *
82      *   THIS INPUT DRIVER READS 1 START BIT
83      *   8 DATA BITS (MASKS TO 7)
84      *   DOESN'T READ THE STOP BITS
85      *
86      *   HARDWARE REQUIRED IS A LEVEL SHIFTER FROM RS232 LEVELS
87      *   TO TTL LEVELS AND THE INPUT ON BIT 4 OF PORT $FF
88      *
89      *   FOR THE RS232 PORT INPUT--
90      *   Z   = 0 ON THE INPUT PORT = NO START BIT PRESENT
91      *   NZ  = 1 ON THE INPUT PORT = START BIT PRESENT
92      *
93      *   CHAR.INRS2 EQU 4447
94      4447    C5      PUSH    BC
95      4448    D5      PUSH    DE
96      4449    DBFF    TRY.SB IN  A, (INPORT)  CHECK FOR A START BIT
97      444B    E6      AND     $10
98      444D    20      JR      NZ, ST.BIT
99      444F    CD      CALL    CHAR.INKB  CHECK FOR A KEY
100     4452    28      JR      Z, TRY.SB
101     4454    CD      CALL    FIX2KR
102     4457    CD      CALL    CHAR.OUTRS
103     445A    FE      CP      'S
104     445C    CA      JP      Z, BEGIN
105     445F    18      JR      TRY.SB
106     4461    06      LD      B, 9          SET UP THE COUNT
107     4463    16      LD      D, 0          CLEAR OUT THE CHARACTER
108     4465    1E      LD      E, ST.HOLY    DELAY 1/2 BIT TIME
109     4467    CD      CALL    DELAY
110     446A    DBFF    IN      A, (INPORT)
111     446C    E6      AND     $10          MASK OFF THE INPUT
112     446E    28      JR      Z, TRY.SB      JMP TO RETURN IF NO START BIT PRESENT
113     *
114     *   MUST BE A VALID START BIT TO GET HERE
115     *
116     *   GET.MORE NOP
117     4471    1E      LD      E, ST.WHDLY    SET UP FOR WHOLE DELAY
118     4473    CD      CALL    DELAY
119     4476    DBFF    IN      A, (INPORT)
120     4478    E6      AND     $10          MASK OFF THE OTHER BITS
121     447A    B2      OR      D
122     447B    57      LD      D, A          OR IT IN WITH WHAT IS RECIEVED SO FAR
123     447C    CB0A    RRC      D          PUT CHAR BACK INTO D
124     447E    10      DJNZ    GET.MORE      SHIFT IN PREPERATION FOR NEXT TIME
125     *
126     *   GOT ALL BITS TO GET HERE

```

```

127     *
128     4480    00      NOP
129     4481    00      NOP
130     4482    CB0A    RRC      D
131     4484    CB0A    RRC      D
132     4486    CB0A    RRC      D
133     4488    7A      LD      A, D          PUT CHAR IN A REG FOR EXIT
134     4489    2F      CPL
135     448A    E6      AND     $7F          MASK IT OFF
136     448C    D1      POP     DE
137     448D    C1      POP     BC
138     448E    C9      RET

```

```

152     *
153     *   OUTPUT RS232 DRIVER
154     *   USES REGISTERS AS LISTED BELOW
155     *
156     *   A--IS USED TO OUTPUT THE CHARACTER BIT AT A TIME AND HAS THE CHAR ON ENTRY
157     *   B--IS USED TO HOLD THE BIT COUNT
158     *   D--IS USED TO HOLD THE CHAR

```

Program continues

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```

159      *      E--IS USED FOR THE DELAY COUNTER
160      *
161      *      TO CALL USE 'CALL CHAR.OUTRS' WITH THE ASCII CHARACTER IN
162      *      A REG
163      *      RETURN IS WITH RET
164      *
165      *      THIS DRIVER PUTS OUT :
166      *      1 START BIT
167      *      7 DATA BITS
168      *      2 STOP BITS (NO PARITY)
169      *
170      *      HARDWARE REQUIRED IS A LEVEL SHIFTER TO RS232 LEVELS
171      *      DRIVEN BY BIT 4 OF OUTPUT PORT $FF
172      *
173      7FAB      CHAR.OUTRS EQU *
174      7FAB 57      LD      D,A
175      7FAC 06 07      LD      B,7
176      7FAE 3E 10      LD      A,$10      SET UP A FOR THE START BIT
177      7FB0 C802      RLC      0          BIT 0-->1
178      7FB2 03FF      OUT     (OUTPORT),A  DO THE START BIT
179      7FB4 C802      RLC      0          BIT 0-->2
180      7FB6 C802      RLC      0          BIT 0-->3
181      7FB8 C802      RLC      0          BIT 0-->4
182      7FBA 1E A3      PUT.MORE LD      E,PUT.DLY
183      7FBC CD E47F      CALL     DELAY
184      7FBF 7A      LD      A,0
185      7FC0 2F      CPL
186      7FC1 E5 10      AND     $10      MASK OFF BIT 4
187      7FC3 03FF      OUT     (OUTPORT),A  OUTPUT THE BIT
188      7FC5 C80A      RRC      0
189      7FC7 10 F1      DJNZ    PUT.MORE    THIS WORKS ON B REG ONLY
190      7FC9 1E A3      LD      E,PUT.DLY
191      7FCB CD E47F      CALL     DELAY
192      7FCE 3E 00      LD      A,0      DO THE STOP BITS BECAUSE MUST BE FINISHED
193      *                                TO GET HERE
194      7FD0 03FF      OUT     (OUTPORT),A
195      7FD2 C80A      RRC      0          FIX UP THE POSITION
196      7FD4 C80A      RRC      0
197      7FD6 C80A      RRC      0
198      7FD8 1E A3      LD      E,PUT.DLY    DO THE STOP BITS
199      7FDA CD E47F      CALL     DELAY
200      7FDD 1E A3      LD      E,PUT.DLY
201      7FDF CD E47F      CALL     DELAY
202      7FE2 7A      LD      A,0
203      7FE3 C9      RET

```

Z80 ASSEMBLER V1.8C 79/12/20. 15.19.07. FILE NAME--TERM1--300 BAUD TERMINAL
DELAY ROUTINE

```

196      *
197      *      GENERAL PURPOSE DELAY SUBROUTINE
198      *
199      *      ASSUMES THE DELAY COUNT IS IN REG E
200      *
201      *
202      *      CALL WITH 'CALL DELAY'
203      *      RETURNS WITH E SET TO 0
204      *
205      44CC 00      DELAY NOP
206      44CD 00      NOP
207      44CE 00      NOP
208      44CF 00      NOP
209      44D0 00      NOP
210      44D1 10      DEC      E
211      44D2 20 F8      JR      NZ,DELAY
212      44D4 C9      RET
213      4400      END      BEGIN

```

Z80 ASSEMBLER V1.8C 79/12/20. 15.19.07. FILE NAME--TERM1--300 BAUD TERMINAL
SYMBOL TABLE

| | | | | | | | | | |
|----------|------|-----------|------|------------|------|------------|------|----------|------|
| BEGIN | 4400 | CHAR.INKB | 443A | CHAR.INRS2 | 4447 | CHAR.OUTRS | 448F | COMP | 4403 |
| DELAY | 44CC | DONE | 4446 | FIX2KR | 441E | FIX2TV | 440C | GET.MORE | 4470 |
| IMPORT | 00FF | INPUT.KB | 0B40 | LOWCASE | 441B | MON.TOP | 4091 | NOT.BK | 4412 |
| NOT.BS | 442A | NOT.CLEAR | 4439 | NOT.LF | 4424 | NOT.TAB | 4433 | OUTPORT | 00FF |
| PUT.DLY | 00A3 | PUT.MORE | 44A0 | RT | 441D | ST.BIT | 4461 | ST.HOLY | 0050 |
| ST.WHOLY | 00A2 | TOPSTK | 45FF | TRY.SB | 4449 | | | | |

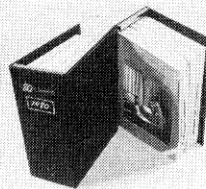
Z80 ASSEMBLER V1.8C 79/12/20. 15.19.07. FILE NAME--TERM1--300 BAUD TERMINAL
CROSS REFERENCE LIST

| | | | | |
|------------|------|------|-------|-----|
| BEGIN | 4400 | 13 0 | 104 | 213 |
| CHAR.INKB | 443A | 60 0 | 99 | |
| CHAR.INRS2 | 4447 | 17 | 93 0 | |
| CHAR.OUTRS | 448F | 102 | 160 0 | |

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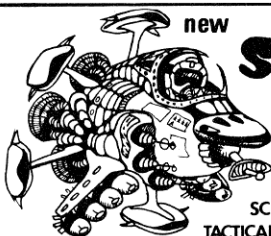
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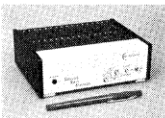
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| | | | | | | | | | |
|-----------|------|-------|-------|------|-----|-----|-----|-------|-----|
| COMP | 4403 | 17 D | 20 | | | | | | |
| DELAY | 44CC | 109 | 118 | 172 | 180 | 188 | 190 | 205 D | 211 |
| DONE | 4446 | 61 | 63 | 66 D | | | | | |
| FIX2KR | 441E | 35 D | 101 | | | | | | |
| FIX2TV | 440C | 18 | 22 D | | | | | | |
| GET.MORE | 4470 | 116 D | 124 | | | | | | |
| INPORT | 00FF | 9 D | 96 | 110 | 119 | | | | |
| INPUT.KE | 0840 | 8 D | 60 | | | | | | |
| LOWCASE | 4418 | 26 | 29 D | | | | | | |
| MON.TOP | 4091 | 7 D | 65 | | | | | | |
| NOT.BK | 4412 | 23 | 25 D | | | | | | |
| NOT.BS | 442A | 40 | 43 D | | | | | | |
| NOT.CLEAR | 4439 | 50 | 53 D | | | | | | |
| NOT.LF | 4424 | 36 | 39 D | | | | | | |
| NOT.TAB | 4433 | 44 | 49 D | | | | | | |
| OUTPORT | 00FF | 10 D | 167 | 176 | 183 | | | | |
| PUT.DLY | 00A3 | 3 D | 171 | 179 | 187 | 189 | | | |
| PUT.MORE | 44A0 | 171 D | 178 | | | | | | |
| RT | 4410 | 28 | 30 D | | | | | | |
| ST.BIT | 4461 | 98 | 106 D | | | | | | |
| ST.HDLY | 0050 | 4 D | 108 | | | | | | |
| ST.WHDLY | 00A2 | 5 D | 117 | | | | | | |
| TOPSTK | 45FF | 6 D | 13 | | | | | | |
| TRY.SB | 4449 | 96 D | 100 | 105 | 112 | | | | |

0 LINE(S) WITH ERRORS
28 SYMBOLS CREATED

0 LINE(S) WITH WARNINGS
73 REFERENCES

436 MILLISECONDS USED

Program Listing—Level II

Z80 ASSEMBLER V1.8C 79/12/20. 15.19.29. TERM2 THIS IS THE TERMINAL AT 300 BAUD
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2 EQUILIVANTS
14 TRANSPARENT TERMINAL
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92 CHAR.INRS2 RS232 INPUT DRIVER
151 CHAR.OUTRS
204 DELAY ROUTINE

Z80 ASSEMBLER V1.8C 79/12/20. 15.19.29. TERM2 THIS IS THE TERMINAL AT 300 BAUD
EQUILIVANTS

| | | | | |
|----|------|----------|-----|--------|
| 3 | 7F00 | START | EQU | \$7F00 |
| 4 | 1A19 | SYS | EQU | \$1A19 |
| 5 | 00A3 | PUT.DLY | EQU | 163 |
| 6 | 0050 | ST.HDLY | EQU | 80 |
| 7 | 00A2 | ST.WHDLY | EQU | 162 |
| 8 | 7F00 | MON.STK | EQU | START |
| 9 | 00FF | INPORT | EQU | \$FF |
| 10 | 00FF | OUTPORT | EQU | \$FF |
| 11 | 0033 | TVOUT | EQU | \$33 |
| 12 | 002B | KBINPUT | EQU | \$2B |
| 13 | 0020 | SPACE | EQU | \$20 |

Z80 ASSEMBLER V1.8C 79/12/20. 15.19.29. TERM2 THIS IS THE TERMINAL AT 300 BAUD
TRANSPARENT TERMINAL

| | | | | | |
|----|------|----|------|-----------------------------|---|
| 15 | 7F00 | | ORG | START | |
| 16 | | * | | | |
| 17 | | * | | TRANSPARENT USER'S TERMINAL | |
| 18 | | * | | | |
| 19 | 7F00 | CD | 777F | TERMN | CALL CHAR.INRS2 CHECK THE RS232 INPUT |
| 20 | 7F03 | 28 | 06 | JR | Z,TRY.KB |
| 21 | 7F05 | CD | 187F | CALL | FIX2TV MUST BE A CHAR TO GET HERE |
| 22 | 7F08 | CD | 607F | CALL | TOTV ECHO IT TO TV |
| 23 | 7F0B | CD | 597F | TRY.KB | CALL CHAR.INKB CHECK KEYBOARD FOR CHARACTER |
| 24 | 7F0E | 28 | F0 | JR | Z,TERMN IF NONE--GO CHECK RS232 INPUT |
| 25 | 7F10 | CD | 327F | CALL | FIX2RS MUST BE ONE TO GET HERE |
| 26 | 7F13 | CD | AB7F | CALL | CHAR.OUTRS SO SEND IT OUT THE PORT |
| 27 | 7F16 | 18 | E8 | JR | TERMN |
| | | | | | |
| 29 | 7F18 | FE | 00 | FIX2TV | CP \$0 CHECK FOR CR |
| 30 | 7F1A | 28 | 15 | JR | Z,FIXED ALLOW CR |
| 31 | 7F1C | FE | 08 | CP | 8 CHECK FOR BACKSPACE |
| 32 | 7F1E | 28 | 11 | JR | Z,FIXED |
| 33 | 7F20 | FE | 20 | CP | \$20 CHECK FOR .LT. 20 |
| 34 | 7F22 | 30 | 04 | JR | NC,NOCTL |
| 35 | 7F24 | 3E | 00 | LD | A,0 |
| 36 | 7F26 | 18 | 09 | JR | FIXED |

Program continues

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```

37 7F28 D6 60 NOCTL SUB $60 CHECK FOR LOWER CASE LETTERS
38 7F2A F2 2F7F JP P,LOWCASE
39 7F2D C6 20 ADD $20 ADD 20 AND GET 40 MORE IN FALL THRU
40 7F2F C6 40 LOWCASE ADD $40 LOWER CASE SO CONVERT TO UPPER
41 7F31 C9 FIXED RET CALL THE OUTPUT ROUTINE
43 * LEVEL 2 GIVES 8 FOR BACKSPACE SO NO CHECK IS REQUIRED
44 * AND $A FOR LINEFEED SO AGAIN NO CHECK
45 *
46 7F32 FE 58 FIX2RS CP $5B CHECK FOR UP ARROW--IF SO GIVE OUT ESC
47 7F34 20 02 JR NZ,TRY.TAB
48 7F36 3E 1B LD A,$1B
49 7F38 FE 09 TRY.TAB CP 9 CHECK FOR RIGHT ARROW--IF SO MAKE A TAB
50 7F3A 20 07 JR NZ,TRY.CLEAR
51 7F3C 3E 20 LD A,SPACE PUT A SPACE OUT TO THE TUBE
52 7F3E CD 6D7F CALL TOTV
53 7F41 3E 09 LD A,9
54 *
55 7F43 FE 1F TRY.CLEAR CP $1F CHECK FOR CLEAR TUBE AND IF SO SEND NULL
56 7F45 20 11 JR NZ,GO.OUT
57 7F47 3E 1C LD A,$1C SET CURSOR TO HOME
58 7F49 CD 6D7F CALL TOTV
59 7F4C 3E 1F LD A,$1F CLEAR TV SCREEN
60 7F4E CD 6D7F CALL TOTV
61 7F51 3E 0E LD A,$E TURN ON CURSOR
62 7F53 CD 6D7F CALL TOTV
63 7F56 3E 7F LD A,$7F LOAD UP $7F FOR TRANSMISSION
64 *
65 7F58 C9 GO.OUT RET

```

Z80 ASSEMBLER V1.8C 79/12/20. 15.19.29. TERM2 THIS IS THE TERMINAL AT 300 BAUD
SUPPORT ROUTINES

```

67 *
68 * FOR THE KEYBOARD --
69 * Z=1 = NO KEY DOWN
70 * NZ=0 = A KEY DOWN
71 *
72 7F59 CD 2B00 CHAR.INKB CALL KBINPUT GO GET THE KEY
73 7F5C FE 00 CP 0 CHECK FOR A KEY DOWN
74 7F5E 2B 0C JR Z,DONE+5 DONE IF NO KEY EXIT WITH Z FLAG SET TO 1
75 7F60 FE 01 CP 1 CHECK FOR BREAK ON THE TRS-80 LEVEL 2
76 7F62 20 03 JR NZ,DONE DONE IF NOT ZERO, THEN THERE WAS A KEY SO RETURN WITH
77 * Z SET TO 0 BECAUSE IT WASN'T BREAK
78 7F64 CD 191A CALL SYS IT WAS BREAK SO GO TO TOP OF THE MONITOR
79 7F67 CD 6D7F DONE CALL TOTV ECHO THE CHARACTER
80 7F6A FE 00 CP 0 SET Z FLAG TO OFF
81 7F6C C9 RET
82 *
83 * A REG HAS THE CHARACTER TO BE OUTPUT TO THE TV
84 *
85 *
86 7F6D D5 TOTV PUSH DE, MUST SAVE IY AND DE FOR TVOUT
87 7F6E FDE5 PUSH IY WRITE THE CHARACTER TO THE TV
88 7F70 CD 3300 CALL TVOUT
89 7F73 FDE1 POP IY
90 7F75 D1 POP DE
91 7F76 C9 RET

```

Z80 ASSEMBLER V1.8C 79/12/20. 15.19.29. TERM2 THIS IS THE TERMINAL AT 300 BAUD
CHAR.INRS2 RS232 INPUT DRIVER

```

93 * INPUT RS232 DRIVER
94 *
95 * USES REGISTERS AS LISTED BELOW
96 *
97 * A--IS USED FOR THE INPUT
98 * B--IS USED TO HOLD THE BIT COUNT
99 * D--IS USED TO BUILD THE CHARACTER
100 * E--IS USED FOR THE DELAY COUNTER
101 *
102 * CALL WITH 'CALL CHAR.INRS2'
103 * RETURNS WITH 'RET' WITH THE CHAR IN A REG
104 *
105 * THIS INPUT DRIVER READS 1 START BIT
106 * 8 DATA BITS (MASKS TO 7)
107 * DOESN'T READ THE STOP BITS
108 *
109 * HARDWARE REQUIRED IS A LEVEL SHIFTER FROM RS232 LEVELS
110 * TO TTL LEVELS AND THE INPUT ON BIT 4 OF PORT $FF
111 *
112 * FOR THE RS232 PORT INPUT--
113 * Z = 0 ON THE INPUT PORT = NO START BIT
114 * NZ = 1 ON THE INPUT PORT = CHARACTER RECIEVED
115 *
116 7F77 EQU * CHAR.INRS2 EQU *
117 7F77 DBFF IN A,(INPORT) CHECK FOR A START BIT
118 7F79 E6 10 AND $10
119 7F7B 20 02 JR NZ,ST.BIT
120 7F7D 18 2B JR GOOUT
121 7F7F 06 09 ST.BIT LD B,9 SET UP THE COUNT
122 7F81 16 00 LD D,0 CLEAR OUT THE CHARACTER

```

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```

123 7F83 1E 50 LD E,ST.HOLY DELAY 1/2 BIT TIME
124 7F85 CD E47F CALL DELAY
125 7F88 DBFF IN A,(INPORT)
126 7F8A E6 10 AND $10 MASK OFF THE INPUT
127 7F8C 28 1C JR Z,GOOUT JMP TO RETURN IF NO START BIT PRESENT
128 *
129 * MUST BE A VALID START BIT TO GET HERE
130 *
131 7F8E 00 GET.MORE NOP
132 7F8F 1E A2 LD E,ST.WHOLY SET UP FOR WHOLE DELAY
133 7F91 CD E47F CALL DELAY
134 7F94 DBFF IN A,(INPORT)
135 7F96 E6 10 AND $10 MASK OFF THE OTHER BITS
136 7F98 B2 OR D OR IT IN WITH WHAT IS RECIEVED SO FAR
137 7F99 57 LD D,A PUT CHAR BACK INTO D
138 7F9A CB0A RRC D SHIFT IN PREPERATION FOR NEXT TIME
139 7F9C 10 F0 DJNZ GET.MORE
140 *
141 * GOT ALL BITS TO GET HERE
142 *
143 7F9E CB0A RRC D
144 7FA0 CB0A RRC D
145 7FA2 CB0A RRC D
146 7FA4 7A LD A,D PUT CHAR IN A REG FOR EXIT
147 7FA5 2F CPL
148 7FA6 E6 7F AND $7F MASK IT OFF
149 7FA8 FE FF CP $FF SET ZERO FLAG TO OFF FOR SURE

```

Z80 ASSEMBLER V1.8C 79/12/20. 15.19.07. FILE NAME--TERM1--300 BAUD TERMINAL
CHAR.OUTPUTS

```

140 *
141 * OUTPUT RS232 DRIVER
142 * USES REGISTERS AS LISTED BELOW
143 *
144 * A--IS USED TO OUTPUT THE CHARACTER BIT AT A TIME AND HAS THE CHAR ON ENTRY
145 * B--IS USED TO HOLD THE BIT COUNT
146 * D--IS USED TO HOLD THE CHAR
147 * E--IS USED FOR THE DELAY COUNTER
148 *
149 * TO CALL USE 'CALL CHAR.OUTPUTS' WITH THE ASCII CHARACTER IN A REG
150 * RETURN IS WITH RET
151 *
152 * THIS DRIVER PUTS OUT :
153 * 1 START BIT
154 * 7 DATA BITS
155 * 2 STOP BITS (NO PARITY)
156 *
157 * HARDWARE REQUIRED IS A LEVEL SHIFTER TO RS232 LEVELS
158 * DRIVEN BY BIT 4 OF OUTPUT PORT $FF
159 *
160 CHAR.OUTPUTS EQU *
161 448F C5 PUSH BC
162 4490 D5 PUSH DE
163 4491 57 LD D,A
164 4492 06 07 LD B,7
165 4494 3E 10 LD A,$10 SET UP A FOR THE START BIT
166 4496 CB02 RLC D BIT 0-->1
167 4498 D3FF OUT (OUTPORT),A DO THE START BIT
168 449A CB02 RLC D BIT 0-->2
169 449C CB02 RLC D BIT 0-->3
170 449E CB02 RLC D BIT 0-->4
171 44A0 1E A3 PUT.MORE LD E,PUT.DLY
172 44A2 CD CC44 CALL DELAY
173 44A5 7A LD A,D
174 44A6 2F CPL
175 44A7 E6 10 AND $10 MASK OFF BIT 4
176 44A9 D3FF OUT (OUTPORT),A OUTPUT THE BIT
177 44AB CB0A RRC D
178 44AD 10 F1 DJNZ PUT.MORE THIS WORKS ON B REG ONLY
179 44AF 1E A3 LD E,PUT.DLY
180 44B1 CD CC44 CALL DELAY
181 44B4 3E 00 LD A,0 DO THE STOP BITS BECAUSE MUST BE FINISHED
182 * TO GET HERE
183 44B6 D3FF OUT (OUTPORT),A
184 44B8 CB0A RRC D FIX UP THE POSITION
185 44BA CB0A RRC D
186 44BC CB0A RRC D
187 44BE 1E A3 LD E,PUT.DLY DO THE STOP BITS
188 44C0 CD CC44 CALL DELAY
189 44C3 1E A3 LD E,PUT.DLY
190 44C5 CD CC44 CALL DELAY
191 44C8 7A LD A,D
192 44C9 D1 POP DE
193 44CA C1 POP BC
194 44CB C9 RET

```

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DELAY ROUTINE

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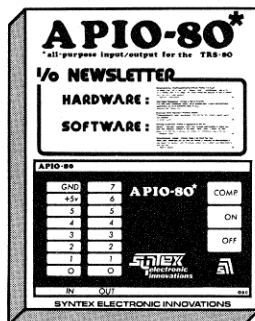
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```

206      * GENERAL PURPOSE DELAY SUBROUTINE
207      *
208      * ASSUMES THE DELAY COUNT IS IN REG E
209      *
210      *
211      * CALL WITH 'CALL DELAY'
212      * RETURNS WITH E SET TO 0
213      *
214  7FE4  00      DELAY  NOP
215  7FE5  00      NOP
216  7FE6  00      NOP
217  7FE7  00      NOP
218  7FE8  00      NOP
219  7FE9  10      DEC     E
220  7FEA  20      JR      NZ,DELAY
221  7FEC  C9      RET
222                END
                0000

```

Z80 ASSEMBLER V1.8C 79/12/20. 15.19.29. TERM2 THIS IS THE TERMINAL AT 300 BAUD
SYMBOL TABLE

| | | | | | | | | | |
|-----------|------|------------|------|-----------|------|----------|------|---------|------|
| CHAR.INKB | 7F59 | CHAR.INRS2 | 7F77 | CHAR.OTRS | 7FAB | DELAY | 7FE4 | DONE | 7F67 |
| FIXED | 7F31 | FIX2RS | 7F32 | FIX2TV | 7F18 | GET.MORE | 7F8E | GOOUT | 7FAA |
| GO.OUT | 7F58 | INPORT | 00FF | KBINPUT | 002B | LOWCASE | 7F2F | MON.STK | 7F00 |
| NOCTL | 7F28 | OUTPORT | 00FF | PUT.DLY | 00A3 | PUT.MORE | 7F8A | SPACE | 0020 |
| START | 7F00 | ST.BIT | 7F7F | ST.HDLY | 0050 | ST.WHDLY | 00A2 | SYS | 1A19 |
| TERMN | 7F00 | TOTV | 7F6D | TRY.CLEAR | 7F43 | TRY.KB | 7F0B | TRY.TAB | 7F38 |
| TVOUT | 0033 | | | | | | | | |

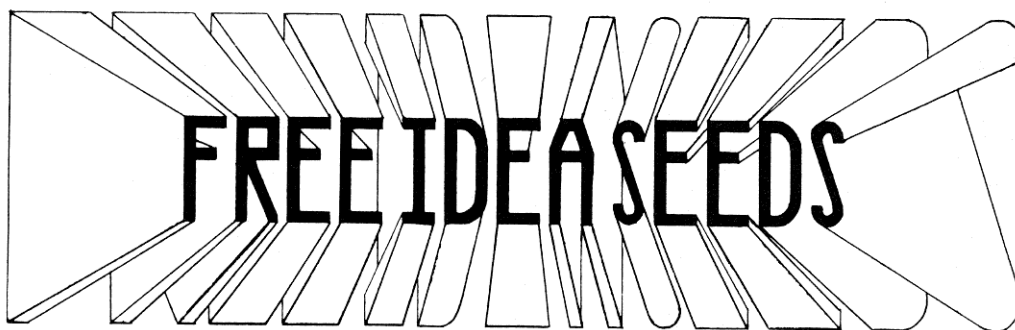
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CROSS REFERENCE LIST

| | | | | | | | | | |
|------------|------|-----|-----|-----|-----|-----|-----|-----|-------|
| CHAR.INKB | 7F59 | 23 | 72 | 0 | | | | | |
| CHAR.INRS2 | 7F77 | 19 | 116 | 0 | | | | | |
| CHAR.OTRS | 7FAB | 26 | 173 | 0 | | | | | |
| DELAY | 7FE4 | 124 | 133 | 183 | 191 | 199 | 201 | 214 | 0 220 |
| DONE | 7F67 | 74 | 76 | 79 | 0 | | | | |
| FIXED | 7F31 | 30 | 32 | 36 | 41 | 0 | | | |
| FIX2RS | 7F32 | 25 | 46 | 0 | | | | | |
| FIX2TV | 7F18 | 21 | 29 | 0 | | | | | |
| GET.MORE | 7F8E | 131 | 0 | 139 | | | | | |
| GOOUT | 7FAA | 120 | 127 | 150 | 0 | | | | |
| GO.OUT | 7F58 | 56 | 65 | 0 | | | | | |
| INPORT | 00FF | 9 | 0 | 117 | 125 | 134 | | | |
| KBINPUT | 002B | 12 | 0 | 72 | | | | | |
| LOWCASE | 7F2F | 38 | 40 | 0 | | | | | |
| MON.STK | 7F00 | 8 | 0 | | | | | | |
| NOCTL | 7F28 | 34 | 37 | 0 | | | | | |
| OUTPORT | 00FF | 10 | 0 | 178 | 187 | 194 | | | |
| PUT.DLY | 00A3 | 5 | 0 | 182 | 190 | 198 | 200 | | |
| PUT.MORE | 7F8A | 182 | 0 | 189 | | | | | |
| SPACE | 0020 | 13 | 0 | 51 | | | | | |
| START | 7F00 | 3 | 0 | 8 | 15 | | | | |
| ST.BIT | 7F7F | 119 | 121 | 0 | | | | | |
| ST.HDLY | 0050 | 6 | 0 | 123 | | | | | |
| ST.WHDLY | 00A2 | 7 | 0 | 132 | | | | | |
| SYS | 1A19 | 4 | 0 | 78 | | | | | |
| TERMN | 7F00 | 19 | 0 | 24 | 27 | | | | |
| TOTV | 7F6D | 22 | 52 | 58 | 60 | 62 | 79 | 86 | 0 |
| TRY.CLEAR | 7F43 | 50 | 55 | 0 | | | | | |
| TRY.KB | 7F0B | 20 | 23 | 0 | | | | | |
| TRY.TAB | 7F38 | 47 | 49 | 0 | | | | | |
| TVOUT | 0033 | 11 | 0 | 88 | | | | | |

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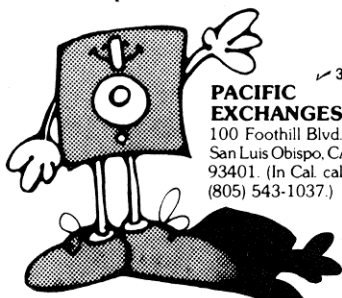
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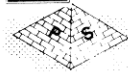
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*Why punt around with winking cursors
when you can make extra points by blocking?*

Block that Cursor

Ron Balewski
412 E. Ridge St.
Nanticoke, PA 18634

One day I saw a software ad that fascinated me: It was for a patch to turn the TRS-80 cursor into a block cursor. I thought that might be a nice thing to have, but, because I'm a cheapskate, I decided not to buy it. I'd write it instead!

Program Listing 1 is the fruit of my efforts. Type it in, run it, and you have a block cursor!

Let's examine the program.

First, the program had to be tied into the video display driver routine—that was no problem. The Level II Manual told me that the driver address started at 16414.

Being baffled at this point, I did what any competent programmer would do—I punted. I knew that I didn't want scrolling and character printing in my program, so I decided to let the original driver do that.

I thought that all I'd do then

was put a block character at the current cursor position which (again, according to the Level II manual) is stored at 16416. With this notion, I ground out some machine code. I didn't think it would be worth it to load EDTASM for such a small amount of code. My Program logic then looked something like this:

1. Call Radio Shack's video driver routine.
2. Put a block character in the current cursor position.
3. Return.

Voila!

Next, I converted everything to decimal, typed it into data statements, loaded it with BASIC, and patched it into the interpreter. Voila!! Block cursor!!

Now to test it. I listed the program—oops! Tacked onto the end of each line was a block cursor! Evidently the Radio Shack driver doesn't write a cursor every time it's called. This minor bug wouldn't do, so I tried to rectify the situation.

Finally, after some head-scratching, I came up with the answer. After my routine calls the Radio Shack driver, I look at the cursor position. If it contains a Radio Shack cursor then I put a block there. There must be a better way to do this, but it works for me.

You must first set memory size to 32635 because the block sits between 32635 and 32654. This is not the top of memory in a 16K computer. I often use the KBEEPFIX module by Dennis Kitz (80 *Microcomputing*, Feb-

ruary, 1980). Although I have a new style of keyboard that doesn't need debouncing (yet), I like the beep and auto-repeat features. Anyway, this block cursor program fits right under KBEEPFIX.

If you use another upper memory patch, or have a machine with more or less than 16K of memory, this program is relocatable. All you have to change then are the parameters of the FOR-NEXT loop in line 10, and the POKE statements in lines 60 and 70.

The cursor is the graphic character with the top four pixels lit (character code 143). I tried all six pixels (code 191), but the cursor extended too far below the text for my taste. I'm happy with the character I'm using. If you want to change to a different one (graphic or alphanumeric), just change the 143 in the data statement to the code for the particular character you want.

I feel that this patch, along with KBEEPFIX, adds a touch of elegance to the TRS-80. Try it, you'll like it!

If you have any questions or problems, please write me at my home address. I'd be glad to hear from you. ■

```

10 FORK = 32635 TO 32654
20 READX
30 POKEK,X
40 NEXTK
50 DATA245,197,205,88,4,237,75,32,64,10,254,95,32,3,62,143,2,193,241,201
60 POKE16414,123
70 POKE16415,127
80 END

```

Program Listing 1. Block Cursor Patch Program

Impress your computer. Answer some familiar prompts in hex.

Smart Answers

James F. Williams
720 West Haven Blvd.
Rocky Mt., NC 27801

How many times have you wanted to answer the SYSTEM prompt with /hex number? Want to answer the BASIC INPUT prompt with a non-string hex reply? Or PEEK and POKE hex addresses? Do you need to see the answer to a previous calculation in hex? All these goodies are at your command with Convert, by typing one of two shifted keys per conversion.

The two commands that activate this program are the shifted C and shifted B keys. Shift C implements a replacement conversion that deletes the number you typed in before hitting enter or a non-hex character, and substitutes a five-character conversion, using leading 0s and an H after hex numbers. Shift B activates a backward

search from the current cursor position for the last displayed decimal string. It marks the end of the string on the screen with an @ and replaces it with the hex equivalent at the cursor location. Both commands cause the program to generate characters just as if they were typed in by hand: The new characters are not only on the screen, but in the input buffer as well.

The following examples are offered for clarification. The shift key, enter key and break key are designated by <SH>, <EN>, and
, respectively.

- Problem: $(7E00H - 7D29H) \times F4H = ?$
Type: `?(7E00H <SH> C - 7D29H <SH> C) * F4H <SH> C <EN>`
Comment: The answer is in decimal. To convert to hex, type: `<SH> B
`
- Problem: Begin execution of a machine language program with an entry point of 7E00H
Type: `SYSTEM <EN> / 7E00H <SH> C <EN>`
- Problem: Write a short program that will allow you to examine two adjacent memory

locations as a two-byte word in hex.

Type: `10 INPUT H: ?PEEK(H) + PEEK(H + 1) * 256: GOTO 10 <EN>`

Comment: Program is in. Now we will execute it.

Type: `RUN <EN> 40E8H <SH> C <EN>`

Comment: Answer is in decimal. To convert, type: `<SH> B` We can now examine what the contents of 40E8H point to.

Type: `<SH> C <EN> <SH> B`
Comment: We could have deleted the hex number with `<SH>←` and typed in a hex number.

- Problem: Type in the following BASIC program line, and then EDIT the PEEK address to 3820H to demonstrate that the `<SH> C` command works in EDIT mode, (I)nsert submode.

Type: `20?PEEK(123);:GOTO20 <EN>`

Comment: The line is now in memory to EDIT,

Type: `EDIT20 <EN> S13DI3820H <SH> C <EN>`

Comment: We (S)earched for

a 1, (D)eleted three characters, (I)nserted 3820H, (C)onverted it, and concluded EDITing.

Note: When using shift C after an address with POKE, be sure to leave a space between the E in POKE and the first hex character, or the E will be interpreted as a hex character.

CONVERT uses three ROM routines. 1E4FH converts an unsigned decimal string pointed to by HL and terminated with a 0 byte into a two-byte value stored in DE. Radio Shack, in its infinite wisdom, decided that it was not necessary for the routine to convert 65530 - 65535 (FFFAH - FFFFH). Therefore, the largest decimal number that this routine will convert is 65529. Larger numbers will produce a SYNTAX error.

132FH converts a two-byte value stored in 4121H to an unsigned decimal string beginning at the address pointed to by HL. It is good to 65535. RST 18H is a one-byte call to 18H. The routine there compares DE to HL (HL-DE) and sets the condition flag without altering DE or HL. ■

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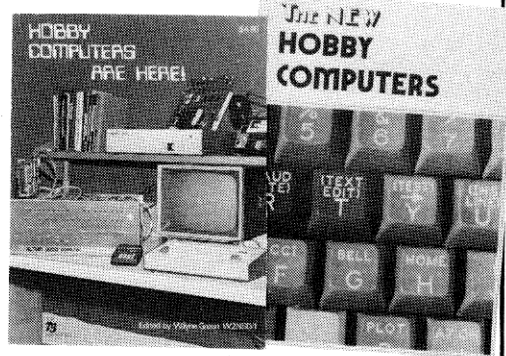
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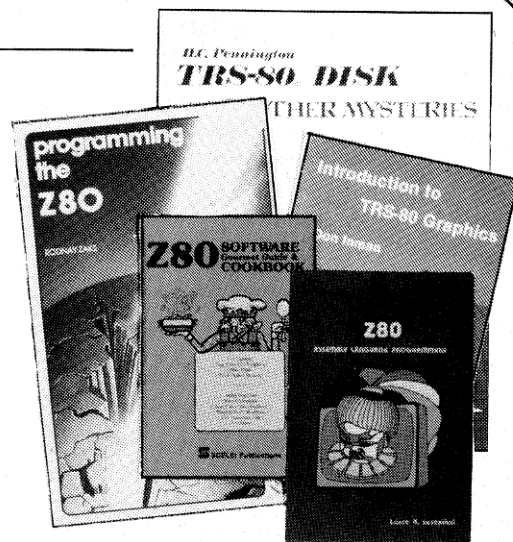
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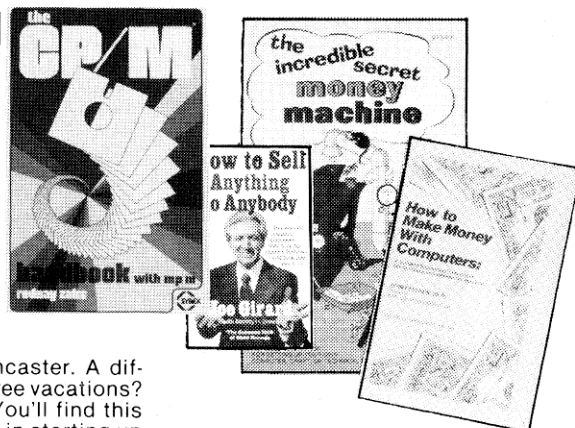
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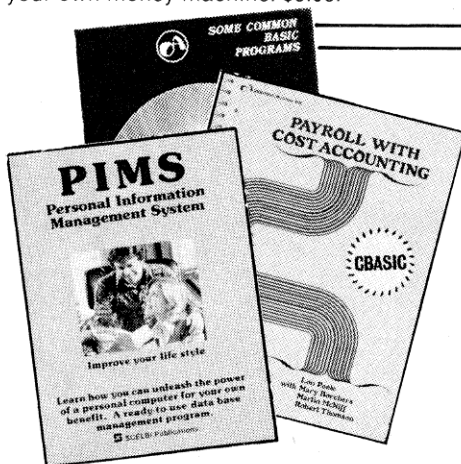
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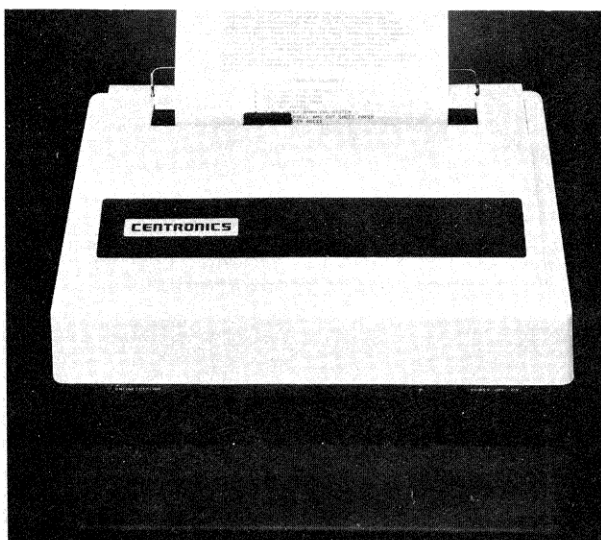
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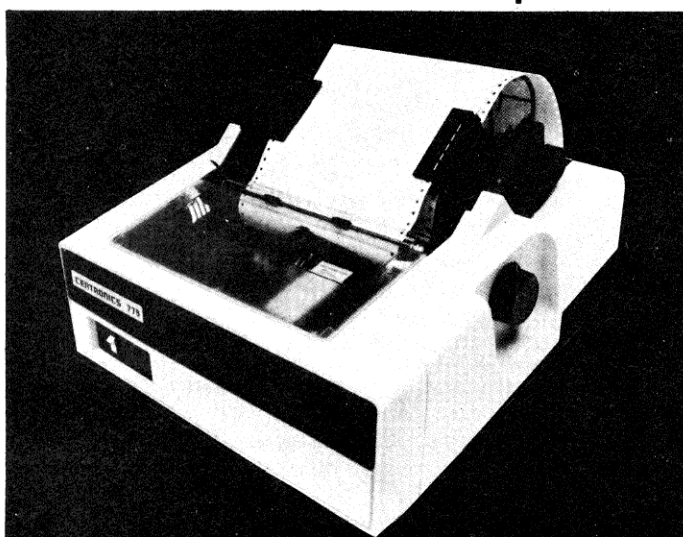
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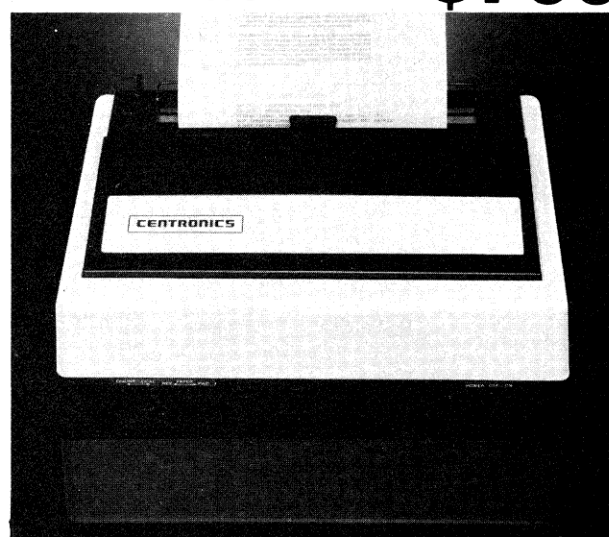
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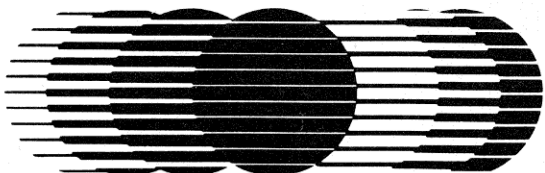


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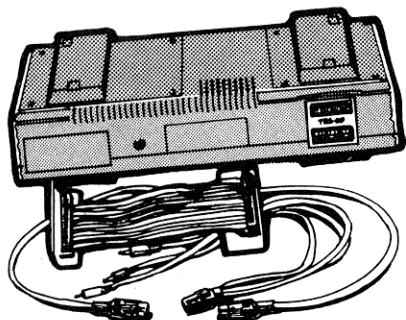
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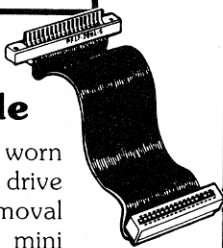
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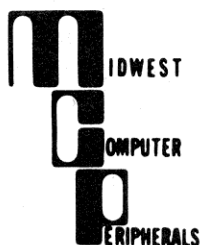
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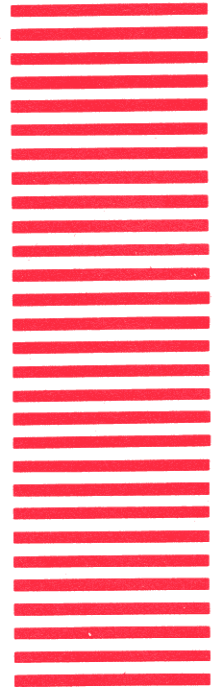
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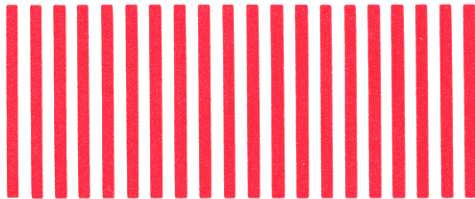
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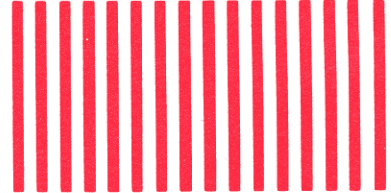
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